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The Impact of Crude Oil Price Shocks on Macroeconomic Variables of Oil Exporting Economies in Sub Saharan Africa Region

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The Impact of Crude Oil Price Shocks on Macroeconomic Variables of Oil Exporting Economies in Sub Saharan Africa Region

By

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"Failure is not an option in life"

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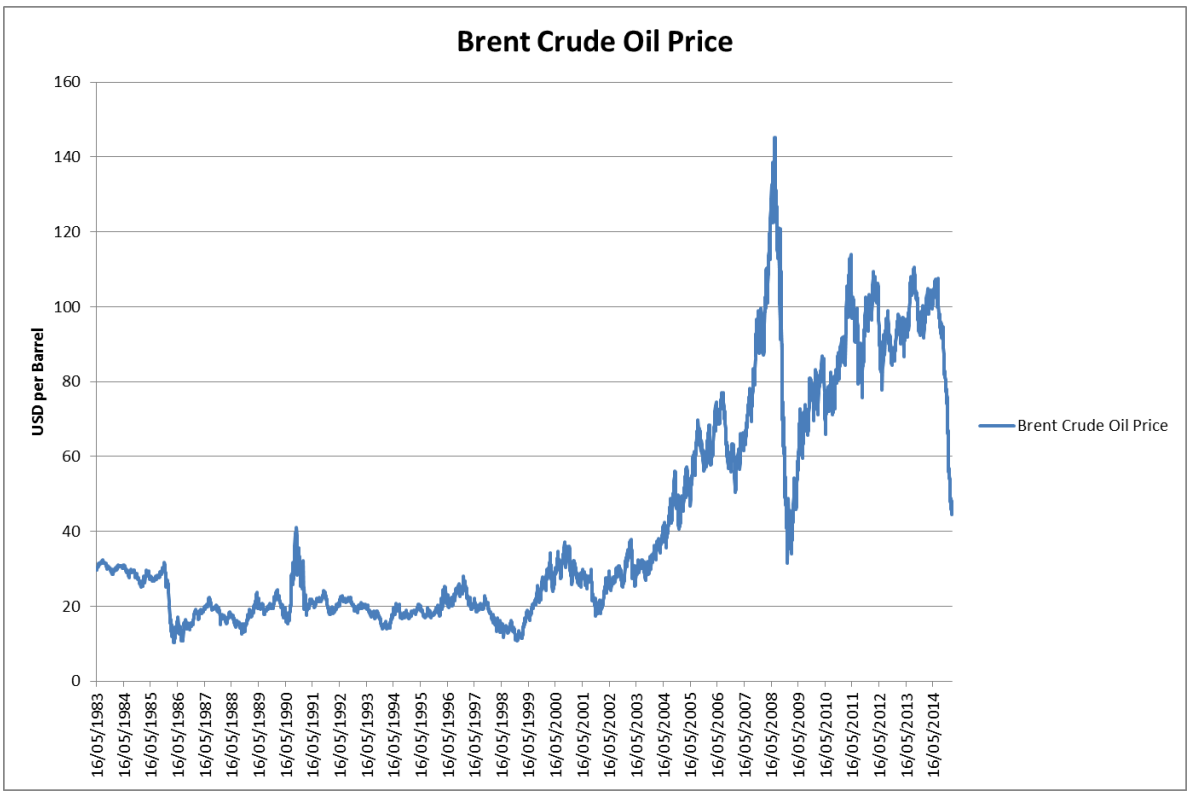
Abstract:

This study investigates the impact on macro-economic variables of oil price shocks for net oil exporters in Sub-Sahara Africa (SSA). Yearly observations from 1980 to 2014 are used to analyse the impact of unexpected oil price shocks and determine the effects of these shocks on a number of macroeconomic country indicators using a structural vector autoregession (SVAR) methodology[i]. The findings showed that some variables respond to shocks positively, whilst others showed negative responses. The relationship between variations in oil prices, country corruption and the country-specific borrowing patterns of these oil exporting SSA countries where also found to be correlated.

1. Introduction:

Due to the heavy dependence of many world economies on oil production and supply it is not surprising that one may observe significant sensitivity to sudden changes in crude oil prices. Oil price volatility has substantially increased since the early 2000's, as is depicted in Figure 1.

Figure 1 Oil price volatility Brent Crude Oil Spot Price (data source Bloomberg, 2016)



By examining time series changes in the price of oil one may see that there are both upward and downward price oscillations of different magnitudes. Some of these will have little or no impact on the macro-economic variables and wealth of various countries. However, countries whose economies are dependent on the importation or exportation of oil may experience a significantly devastating impact on country prosperity and citizen wealth as a result of sudden oil price changes. The sensitivity of a specific country to fluctuations in oil prices, particularly to an

unexpected price change, is dependent on the country status as being a net oil importer or exporter.

Existing research largely focuses upon positive price shocks on developed countries that are net importers (Mendoza and Vera 2010). There is considerably less published research on downward oil price shocks and the impact on net exporting economics and, in particular, developing economies. Mendoza and Vera (2010) document an asymmetric reaction to oil price shocks. Oil, as a major source of energy, is important to both the overall world economy and country-specific, macroeconomic variables such as GDP, equity markets, and inflation as well as the business cycle. As an important input to most industries and economies of the world, energy plays a central role in the global economy. Accordingly, any altering of energy sources which increases energy price movement either positive or negative increases uncertainty in the oil market. It appears difficult to ascertain a definitive description of an oil price shock in the literature, however, Huntington (2005) differentiates between higher oil prices and oil price shocks. He argues that when "oil prices move steadily higher but not rapidly over consecutive months it is merely higher oil prices while an oil price shock is when oil prices move rapidly upward over consecutive months" (Huntington 2005).

The fluctuations in crude oil prices result in differing short and long run repercussions for various countries, which is dependent on their oil importing or exporting status. This impact has been examined by numerous studies (Basher, 2012; Effiong, 2014; Fowowe & Iwayemi, 2011; Henriques & Sadorsky, 2011; Mehrara & Mohaghegh, 2011; Omojolaibi, 2013). This existing literature focuses on the detrimental impact of oil-price shocks for developed economies and some developing economies. However, limited empirical studies focus upon the impact of oil price shocks on the SSA exporting oil regions. This study adds to the literature by examining the magnitude of the impact on the macroeconomic variables of oil exporting countries in the SSA to oil-price shocks.

SSA[1] is considered the fastest growing oil-producing region worldwide. According to Africa development bank and IMF (2013), SSA oil production has risen by 40 per cent over the past decade. Despite the rise in oil production, citizens of oil production countries such as Nigeria, Angola, Cameroun and Gabon live in extreme poverty. This study also investigates the government borrowing pattern of these oil-exporting countries during upward oil-price shock periods, to examine if these borrowings have had any adverse effect on the macro-economy, possibly contributing to the poverty of its citizenry. The study further investigates if there is any correlation between the occurrence of oil-price shocks and corruption in oil-exporting countries using Corruption Perception Index data.

The specific exporters of oil in the SSA are Angola, Cameroon, Chad, Congo Republic, Equatorial Guinea, Gabon, Nigeria, South Sudan, Côte d'Ivoire and recently Ghana. The selection of these countries is based on the availability of data. South Sudan was removed from the analysis due to lack of data as a result of emerging from a long civil war and then the occurrence of a large growth rate of 24%, causing South Sudan to be an outlier in the analysis.

Oil is the backbone of most oil-exporting countries within the SSA economy according to the International Monetary fund (2011). Exploratory prospecting in the SSA region is of growing importance and includes recent large discoveries of oil in Angola, Nigeria, and Equatorial Guinea, and new discoveries in Uganda and Ghana (IMF, 2011). In 2013 alone, the revenue of the eight largest oil countries in SSA was approximately US$65 billion (African Development Bank, 2009). The potential for oil revenues to boost economic growth in the SSA region is significant. This creates possibilities to promote economic diversification, which may enhance higher and stable economic growth. However, this is dependent on sound administration and equitable policies regarding oil revenue allocation to ensure this opportunity is not squandered or misappropriated. As pointed out by the African Development Bank (2009) "the key challenge for harnessing oil

[1] SSA countries include Angola, Benin, Botswana, Burkina Faso, Burundi, Cape Verde, Cameroon, Central African Republic, Chad, Comoros, Congo Democratic Republic, Congo Republic, Côte d'Ivoire, Eritrea, Ethiopia, Gabon, The Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, São Tomé and Príncipe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia and Zimbabwe.

resources is making the right strategic choices and synchronizing their implementation in a context that supports fiscal prudence and minimizes macroeconomic distortions".

Challenges facing the oil-producing SSA countries include ensuring a sustainable supply of oil, at competitive market prices. Several issues exist that have hindered the achievement of this goal, including volatile oil prices and shocks. To enhance energy security in the region, which is a challenge, there should be a growing interdependent partnership among all stakeholders between net importing and net exporting countries in SSA (African Development Bank, 2009).
Over the years, oil-price shocks have been the subject of many writers. Several studies find oil prices impact on both economic growth and activity (Brown & Yücel, 2002; Kilian & Park, 2009; Mehrara & Mohaghegh, 2011; Peersman & Van Robays, 2012).

Oil price shocks are price fluctuations resulting from "changes in either the demand or supply side of the international oil market" (James D Hamilton, 1983). Disruption in supply of oil include OPEC quotas and production, political unrest in the Middle East, militant action from groups like Boko Haram in the Niger Delta of Nigeria, and fighting in South Sudan. Such disruptions can cause changes in the international oil market. Oil price shocks may be both positive and negative with varying consequential impacts on the macroeconomic indicators for both exporting and importing countries. For example, inflation, money supply and huge fiscal deficits could be impacted.

During the 1970's, recession experienced by both the US and some Europeans countries was preceded by oil shocks caused by the Middle East conflicts. A subsequent rise in research focusing on the impact of oil price shocks on macro economies followed. Studies (Barrell, Delannoy, & Holland, 2011; Chevallier, 2013; Omojolaibi, 2013) each "found a significant negative effect between oil-price shocks and GDP suggesting that oil shocks were responsible for economic recessions" (James D Hamilton, 1983).

Farzanegan and Markwardt (2009), Fowowe and Iwayemi (2011) and Barrell et al.(2011) focus on the economic impact of positive oil price shocks in developed oil importing countries. Few, if

any, of such studies that have been done focus on oil exporting counties particularly in the SSA region. Oil-price shocks can affect the macro-economy of developing oil-exporting countries within the SSA region through a number of different avenues. For instance, an oil boom for the oil-exporting SSA region will stimulate economic activities from both the demand and supply sides. An oil-price shock poses new challenges for oil-importing countries including impacting on exchange rates as well as the circulation and level of revenue from both exports and imports. The price of oil fluctuates due to changes in the demand on the world market, which affects economies of countries that import and export oil. Various studies that explore oil-price shock impacts, both in oil importing and exporting economies, reveal the importance of variation in crude-oil prices (Al-Rjoub, 2005; Barrell et al., 2011; Kilian & Park, 2009; Mehrara & Mohaghegh, 2011).

The most significant impact for oil exporting countries is government expansion of fiscal policy via their use of petrol dollars to finance expenditure from oil exporting revenues. This is supported by evidence from Brown and Yucel (2002), showing a link between "oil price changes and aggregate economic activity". They found "that an oil price shock leads to a decline in real GDP, increases in the federal funds rate and other interest rates, and an increase in the price level" (Brown and Yucel, 2002).

The considerable crude oil resources in SSA can, if properly managed, help accelerate growth in the region. Large upward oil price shocks provide an excellent opportunity for "oil exporting countries to increase revenues and achieve economic growth" (African Development Bank and African Union 2009). However, for oil-dependent importing countries, upward price shocks can stifle economic growth through increasing cost burdens. A number of studies have shown that energy consumption makes a significant contribution to the economic growth in SSA (African Development Bank and African Union 2009). Petroleum consumption forms an integral part of SSA energy mix, as evidenced by statistical records from the World Bank database. These show "petroleum consumption as a percentage of total energy consumption over the past few years was above 50% and in the neighbourhood of 70% onwards" (African Development Bank, 2009).

Therefore, oil-price shocks could have significant impact on the macroeconomic variables for those exporting and importing countries in SSA.

Hamilton (1983) also found evidence of a strong correlation between oil-price increases and successive economic downturns in the United States (US) during the post-World War Two period. Gounder and Bartleet (2007) further demonstrate the association between oil price shocks and the impact on macroeconomic variables. The impact of macroeconomic distortions and fiscal prudence could be minimized from oil and gas price shocks if government policies are implemented to buffer the impact of unexpected shocks. Oil is a non-renewable resource, and plays a pivotal role in the SSA region because it is an indispensable input for growth and economic development.

Research shows that "energy consumption per capita is strongly correlated with the level of economic and social progress" (IMF, 2008). Energy, particularly from oil consumption, plays a pivotal role in the economic growth and development of most countries. In Africa, consumption of global commercial energy is only 3 per cent while it has about 15 per cent of world population. Its share in the production of energy is about 12 per cent and growing rapidly. Increasing demand from China and India, coupled with a lack of expansion in refinery capacity or any spare capacity in major producing economies, are major determinants of increasing oil prices between 2000 and 2009 (African Development Bank, 2009). In 2008, the IMF expected "oil production in the SSA to rise at an average rate of 6 per cent, per year for the foreseeable future". However, recent world events have seen a dramatic decrease in the price of oil by up to 60% or more, making many of these forecasts redundant at least in the short term. Nigeria, Angola, and Sudan hold the majority (70 per cent) of oil reserves (and production) in SSA.

Sizable amounts of oil have been discovered in Albertine and Tanzania, Graben near Uganda, as well as offshore western Ghana and other parts of SSA (African Development Bank, 2009).
All of these countries are considered developing economies that face significant economic and social challenges with much of the region's population in poverty. The great challenge for these

oil-producing SSA nations is to effectively develop this natural resource in a sustainable way to enrich their citizens without harming the environment whilst being competitive on world oil markets. In the instance of positive oil-price shocks, developing exporting countries borrow from other countries like China as well as the World Bank to ramp up extraction and development of their resources in order to improve their standard of living and the country's prosperity. This, in itself, is not a problem; except during periods where extreme negative volatility causes a significant decrease in the country's economy, which is exacerbated by the effect of the leverage. The recent negative volatility in oil prices, combined with the increasing dependency on both oil consumption and oil exports of many SSA countries, significantly weakens their economies and increases political instability. Sustainable management including the level of sustainable foreign borrowing to develop the regions oil resources for the benefit of all need to be addressed in the SSA regions to achieve the transition from a developing economy into a more prosperous, developed and stable economy (African Development Bank, 2009).

Oil price variation will change the cash flow between exporting and importing nations, subject to the proportional oil revenue and expenditure in their economies, respectively. Government revenue for oil exporting countries increases when there is a rise in oil prices. However, increased production will in the long term produce an oversupply in the market due to higher prices. Subsequently, demand for oil will drop due to these higher prices when alternative sources of energy come on line. This study adds to the literature by focusing on the impact of oil price shocks on the macro-economic variables of the net crude oil exporting countries in the developing SSA region.

1.1 Motivation for the study

Existing studies indicate that oil price variation changes the flow of funds of the oil exporting countries in the SSA. When oil prices rise, government revenue increases temporarily for these exporting countries. In the long term it fades due to high prices that will cause demand to fall. Bernanke (2004) argues that positive oil price shocks tend to lower the value added to the

economy as firms suspend investments while they determine if price changes are permanent or transitory.

The direction of the oil price shock has been associated with differing impacts on various countries' economies. These impacts are contingent upon whether a country is a net exporter or importer and also whether the direction of the oil price shock is positive or negative. For example, Ghana recently experienced the adverse impact of electricity rationing due to the high crude oil price. This country uses crude oil to generate electricity and, as the oil price moved upward, the government could no longer afford the crude oil to fuel the power stations and had to resort to rationing electricity. The electricity issue forced major multinational corporations and companies to close down thus affecting the Ghana economy. These impacts took the form of a decrease in government revenue from the collection of taxes, a decrease in investment, a high employment rate, massive poverty, and a lack of infrastructural development in the country.

This study examines the borrowing pattern of government debt during positive or negative crude oil price shock periods as a possible cause of continuing poverty in the region. A partial motivation for this study is to examine the reasons for massive poverty in the SSA region when there are abundant natural resources including crude oil, gold, and other rich minerals. Given the lack or limited studies in context to SSA, this research contributes to existing literature on crude-oil-price shocks and their impacts on macro-economic variables by focusing on developing countries and not on developed economies, where most of the literature situates its research. Also the majority of the existing literature either examines impacts from importing or exporting country dimensions for single-country studies. This study broadens the single country context by conducting a cross-countries study focusing on oil exporting SSA and the impact crude oil price shocks have on their economies. The inclusion of exogenous variables like corruption and political instability, which are common in SSA, is a further extension to the existing literature. This research suggests these governance variables will increase the sensitivity of economies to oil shocks in the sub region of Africa.

A recent article on a Ghana website stated that "Nigeria's stolen crude exceeds Ghana daily production" (www.naijafeed.com). The article pointed out that "missing excess crude amounts to $1 billion or 400,000 barrels of oil stolen over and above recorded daily production". Ghana produces 120,000 barrels per day. The article claims that "there are many challenges confronting Nigeria, as the largest oil producing country in SSA, but the largest problems are oil theft and corruption. Nigeria also faces challenges such as poverty with over 112 million Nigerians categorised as extremely poor. While it is the largest economy in Africa, it is one of the 33 poorest countries in the world" (www.infoplease.com). High rates of infant mortality also plague the region with "3.9 million children dying between 2009 and 2014. In addition 55,000 Nigerian women die every year, 110,000 deaths are a result of diseases, and 10.4 million children are out of school. Over 80 per cent of Nigerian graduates are jobless or unemployed" (www.Ghanaweb.com).

The contrast between oil-rich African nations and the extreme poverty experienced by the African people is perplexing. Most African oil exporters are plagued with poor economies with "low rates of GDP growth, low per-capita incomes (whether measured by parity purchasing power or GNI), poor performance in non-oil sectors, and civil violence and war" (www.Ghanaweb.com). World Bank data confirms that levels of corruption among Africa oil producing countries are some of the worst in the world: Angola, Cameroon, and Nigeria ranking among the most corrupt in the world. "According to the Corruption Perception Index (CPI) de Transparency International, 31 from 47 African countries, many of which are oil exporters, scored below 3 (on a scale of 1 to 10), indicating rampant corruption" (http://www.transparency.org/research/cpi/overview see corruption index in Appendix).

1.2 Research Questions:

The following three research questions are investigated to address the issues identified above.

a) What is the impact of oil price shocks on macroeconomic variables of all oil exporting countries in SSA?

b) Examine the borrowing pattern of oil exporting SSA countries during oil price shocks.

c) Examine the correlation between oil price shocks, country corruption and country GDP.

1.3 Research Objectives:

One of the main sources of financing physical and social infrastructures, in the SSA region is oil revenue. The growing reliance on oil revenue causes the impact of oil shocks to be substantial on a country's macroeconomic variables. This has resultant ramifications for oil exporters' monetary and fiscal policy, economic activities and in turn political stability. For these countries, the "oil income that accrues to the governments will have significant effects on the economic performance with regards to its impacts on government expenditure, money supply, inflation, real exchange rate and imports" (Sturm, Gurtner, & Gonzalez, 2009). Although there is some single-country studies that examine the impacts from oil price shocks on developing economies, this is the first study to examine multi-country impacts within a region. Further, while most previous research deals with the impact of oil shocks on the economy for oil importing countries (James D Hamilton, 1983), little or no research has been done on the oil exporting SSA countries therefore creating a gap in the literature.

This research investigates the impact of oil price shocks on macroeconomic variables of developing oil exporting countries in SSA.[2] Despite the lack of previous studies that focus on the SSA region, this research opens avenues to understand how to better utilise oil revenues for the growth of this economy and promote the well-being of its citizens. Moreover, the research endeavours to provide a better understanding of investment opportunities for foreign capital and promote greater economic prosperity in the SSA region. This, is turn, will assist policy makers to stabilise the economies of countries within the region and improve the standard of living for the entire population.

The study proceeds as follows. Section 1 provides an introduction and the motivation for the study and specifies the research questions and objectives addressed in this thesis. Section 2

[2] SSA is Sub Saharan Africa, excludes countries from North Africa.

provides an overview of the existing oil price shock literature on macroeconomic variables and the theoretical framework. The research methodology, models, data selection, and variables description are presented in Section 3. Section 4 presents and discusses the results including the descriptive statistics and the main findings. Section 5 provides a conclusion to the study and summarises its contributions and recommendations.

2. An overview of the literature

In the past thirty years, numerous studies have examined the relationship between oil price shocks and the impacts on economic variables of particular sets of countries or a specific country. These studies used different methodologies which produced different conflicting results over different time periods and countries. Examples of conflicting results of these studies varies according to whether the country is either a developed or an emerging economy and whether they are oil exporters or importing economies. The focus has been on high oil prices usually leading to a decline over time in the supply of oil as demand drops; production requiring oil as a major energy declines due to it becoming too expensive an input. Various US studies such as James D. Hamilton (2009) and Anzuini, Pagano, and Pisani (2007) indicate that "oil shocks have inflationary effects on the developed economies". Baumeister and Peersman (2008) state that "oil production has a huge impact on oil prices and much higher effects on both GDP and consumer prices in the US economy".

James D Hamilton (1983) examined the impact of oil price shocks on the US economy from 1948 to1972 using six variables to estimate the effect of relatively high oil prices, whereby the results suggested that "seven out of eight recessions during this period were caused by oil price shocks and these shocks decreased US output growth". Other studies have contributed to this evidence suggesting "upward oil price shocks have strong and negative consequences for oil importing countries" (Jimenez-Rodriguez and Sanchez (2005), Peersman and Robays, (2012), Du, Yanan and Wei, (2010), Filis, Degiannakie and Floros, (2011) Wang, Wu and Yang, (2013)). U.S aggregate economic activity seemed to retard due to rising oil prices but failed to be stimulated when oil

prices were falling. This indicates that developed economies such as the U.S. do not respond symmetrically to both upward and downward oil price shocks. Mork (1989), on examining aggregate oil price shocks, failed to find a "significant relationship between oil and GDP". However, when Mork separately examined upward and downward oil price changes he found "a significant relationship between high oil prices and GDP". Brown and Yucel (2002) stated that "rising oil prices signal the increased scarcity of the commodity which is a basic input to production that impacts output growth and reduces productivity". This, in turn, negatively affects real income growth causing unemployment and inflation to increase.

Papapetrou (2001) applied a Vector Auto-regression (VAR) approach to examine the "dynamic relationship among oil prices, real stock prices, interest rates, real economic activity and employment for Greece". His results found that "oil price changes affect real economic activity and employment and were important factors in explaining stock price movement". Sadorsky (1999) examined the impact on stock market returns of oil-price shocks, using unrestricted VAR. His study covered the period from January 1947 to April 1996 using US monthly data. He concluded that "oil-price shocks have asymmetric economic effects" (Sadorsky, 1999) and emphasised the importance of oil prices in regards to the behaviour of macroeconomic variables of a country.

Al-Rjoub (2005) investigated the US stock market reaction to changes in oil prices using a 1985 to 2004 dataset. He employed three econometric techniques in his research: the VAR model; mixed Dynamic; and, Granger Causality. These three methods used gave the same results, indicating when there is a change in oil price, stock markets react negatively. The results from Granger causality indicated that "there exist bi-directional effects of stock markets and oil price shocks", as such "both stock market returns and oil price shocks cause each other" (Al-Rjoub, 2005).

Gounder and Bartleet (2007) examined oil price shocks and economic growth for New Zealand, an oil importing country, using quarterly data from 1989 to 2007. VAR methodology was used in their studies; in particular a "multivariate framework to measure the short-term impact of oil price shocks on economic growth, inflation, real wage and exchange rate" (Gounder & Bartleet, 2007). They found that the impact of oil price change was significant when there was linear and asymmetric oil price increase. "Using the Granger Causality test, impulse response function and variance decomposition they concluded that oil price shocks have direct impact on economic growth an indirect impact through exchange rate and inflation" (Grounder & Bartleet, 2007).

Eltony and Al-Awadi (2001) and Al-mulali, Sab, and Binti (2011) examined oil exporting countries in the middle east characterised by small open economies. Eltony and Al-Awadi (2001) examined the effect of oil price movement on the economy of Kuwait and found oil price shocks impact the demand for money, despite Kuwait monetary policy influence on economic activity being minimal. Al-mulali et al. (2011) investigated the "impact of oil price shocks on Qatar's economy using data from 1970 to 2000". This study used four variables including GDP, inflation, the exchange rate and investments, where oil price shocks have a positive impact on GDP in both short and long run. However, they reported an adverse impact in inflation impact on inflation. "When there is slow output growth and an increase in the real interest rate, the demand for real cash balances fall, and for a given rate of growth in the monetary aggregate, the rate of inflation increases. Therefore, rising oil prices reduce GDP growth and boost real interest rates and the measured rate of inflation" (African Development Bank, 2009).

Jiménez-Rodríguez and Sanchez (2005) presented both theoretical and empirical support regarding the size of price shocks and the impact on economic growth. "The oil price declines in the middle of the 1980s impacted the world price of oil causing a linear relationship between oil prices and economic growth" (Mork, 1989).

The evidence on net oil importing, developing countries indicates they are more exposed to oil shocks than developed countries. This is due to two reasons, mainly because of the less efficient

pattern of energy consumption of these countries. As the International Energy Agency (IEA, 2014) stated: “oil importing, developing countries use more than twice as much oil to produce one unit of output than the OECD countries use”. The second reason is that “these countries are more dependent on imported oil than oil producing countries” (African Development Bank and African Union, 2009).

Oil prices changes have had a direct impact on investment decisions of firms and households as is established by several studies (Ali Ahmed & Wadud, 2011; Kilian, Rebucci, & Spatafora, 2009; Mehrara & Mohaghegh, 2011; Naranpanawa & Bandara, 2012). The use of existing capital and labour resources and the investment in new physical and human capital may be affected by the shocks. Usually, in net oil exporting countries crude oil price and economic growth are positively correlated, while in net oil importing countries they are negatively correlated; however, there are some studies that show this relationship is more complicated in Africa. For instance, Fowowe and Iwayemi (2011) found “that oil price shocks do not impact on Nigerian output, however, lower oil prices significantly reduce their economic activity”. Their results suggest that “oil price shocks do not have a major impact on most macroeconomic variables in Nigeria over the period 1985 to 2007. The results of the Granger-causality tests, impulse response functions, and variance decomposition analysis all showed that different measures of linear and positive oil shocks have not caused output, government expenditure, inflation, nor the level of the real exchange rate. The tests support the existence of asymmetric effects of oil price shocks due to the finding that negative oil shocks significantly explain changes to cause output and the real exchange rate”.

Umar and Kilishi (2010) investigated the impact of crude oil price changes on four key macroeconomic variables in the Nigeria economy over the period 1970 to 2008 using a VAR model. They find “oil price changes have a significant impact on real GDP, money supply and unemployment”. However, Umar and Kilishi (2010) results found that “the impact on the consumer price index was not significant, but the impact on money supply posed a danger to the management of the economy since it was a major macroeconomic policy instrument, whereas

GDP and unemployment are key macroeconomic policy targets". If exogenous variables like crude oil prices shocks have significant influence on key macroeconomic variables, then it makes sense for governments whose economy becomes susceptible to these shocks to mitigate the effect by diversifying their economies. However, even in Australia, a developed nation, we see a concentration of investment in the mining sector when commodity prices are high to the neglect of other sectors of the economy. Once commodity prices drop, there is always a scramble to invigorate other sectors of the economy.

"While the structure of various economies may affect the extent to which economic growth is retarded following a price shock, these findings also imply that oil-price shocks contribute to the volatility in most of the countries"(Jiménez-Rodríguez & Sanchez, 2005). However, for countries like the US and Canada, both upward and downward oil shocks have significant impact indicating a more symmetric relationship. Oil exporting Norway "exhibits positive price shocks impacting growth positively and negative price shocks impacting growth negatively" (Gounder & Bartleet, 2007). "This may be expected if demand effects (especially the terms of trade effect) are stronger than supply effects, particularly in a relatively small economy where oil exports are substantial. The literature on energy prices and economic growth suggests that price shocks, especially to oil resources, lead to recession. A number of different transmission mechanisms have been asserted, consistent with the global nature of energy in modern economies" (Gounder & Bartleet, 2007). Gounder and Bartleet (2007) point out that "New Zealand a net oil importer exposes its domestic economy to the impact of oil price shocks for the same reasons as other countries".

Jiménez-Rodríguez and Sanchez (2005) suggests "there is evidence of a non-linear impact of oil prices on real GDP growth in both oil importing and exporting countries", and also states "the effects of an increase in oil prices on real GDP growth are found to differ substantially from those of an oil price decrease, providing evidence against the linear approach that assumes that oil prices have symmetric effects on the real economy". When prices increases, it has larger magnitude of impact on GDP than when the oil price declines, with the latter being insignificant. An "increase in oil prices has a significant negative impact on GDP growth in all oil importing

countries except Japan…possibly due to the special circumstances undergone by the Japanese economy".(Jiménez-Rodríguez & Sanchez, 2005). The impact of an oil price rise on GDP growth are overall strongest for the US, although Germany, France and Italy show similar effects when the non-linear modelling was used. They discovered that "a decline in oil prices significantly affects only a few countries, having a positive impact on the US and UK economies while doing damage to the Canadian economy" (Jiménez-Rodríguez & Sanchez, 2005).

The magnitude of the impact on macroeconomic variables from relatively high oil prices has been the subject of much debate (James D Hamilton, 1996; Lee, Ni & Ratti, 1995; Mork, 1989). Assessment of the symmetry of macroeconomic effects of oil price movements has been investigated separately. Mork (1989) reveals that "there is a correlation between economic growth and energy price decreases in the US", which was significantly different from those where there was energy price increases over the post-World War Two periods. This implies an asymmetric energy price/economic growth relationship for the US, which is an important finding from the economic policy perspective". Mork (1989) found evidence of asymmetries in the case of West Germany, France, the United Kingdom (UK) and Japan. "On the other hand, both oil price increases and decreases are significant for the case of the US and for Canada. Norway, as an oil exporter, is an exception to this trend, with positive price shocks impacting growth positively and negative price shocks impacting growth negatively".

Bashiri Behmiri and Pires Manso (2013) find that in both "the short and long run there is two-way causality relationship between crude oil consumption and economic growth for net oil importing countries in SSA". For net oil exporting countries in SSA, Bashiri Behmiri and Pires Manso (2013) point out that "in the short run there is uni-directional causality relationship between crude oil consumption to GDP growth, however in the long run there is bi-directional causality relationship between crude oil consumption and economic growth". Bashiri Behmiri and Pires Manso (2013) conclude that "reduction of crude oil consumption has a negative impact on economic growth for both net importing and exporting countries in SSA", suggesting that a reduction in crude oil consumption without an increase in energy production destroys the

development process in SSA. Bashiri Behmiri and Pires Manso (2013) revealed that in order to reduce crude oil consumption and decrease oil dependency more attention needs to be focused on crude oil efficiencies policy, such as the reduction of oil quantity used by households, transportation and industrial sectors to minimise waste.

Kilian (2008) pointed out that "energy prices in general and crude oil prices in particular have been endogenous with respect to U.S macroeconomic conditions as far back as early 1970". Kilian (2008) states that "endogeneity here refers to the fact that not only energy prices affect the U.S economy, but that there is reverse causality from U.S and, more generally, global macroeconomic aggregate to the price of oil." The paper showed that "global macroeconomic variables such as economic activity and interest rates clearly depend on supply and demand of energy", stating that "correlation between energy prices and macroeconomic outcomes do not necessarily imply causation".

Kilian (2008), showed that the issue can be resolved by applying statistical transformation to oil prices to extract the exogenous component of the oil price, which leads to an example of the net oil price increase approach proposed by Hamilton (2000). The literature also shows that oil price changes do not only come through exogenous shocks, such as supply disruptions due to political conflicts or oil producing nations intentionally cutting down supply, but can also be driven by endogenous changes in the global macroeconomic aggregates such as inflation, fluctuation in the dollar or change in interest rates (Barsky & Kilian, 2004; Bernanke, 2004; Kilian, 2008). Hence, an investigation of the origins of an oil price shock transmission into the economy needs to be examined as macroeconomic variables could react differently depending on the source of oil price shock.

Table 1: Summary of Literature

Study	Data	Method and Variables	Sig ?
Sadorsky (1999)	USA : Monthly data 1947-1996	VAR(Y, SR)	Yes
Papapetrou (2001)	Greece: Monthly 1989 to 1996	VAR(R, UN, Y)	Yes
Eltony and Al - Awadi (2001)	Kuwait: Quarterly data 1984-1998	VAR(CPI, MS, GOV, NX, OP,)	Yes
Hamilton (2005)	USA; Quarterly 1948-1994	OLS(Y, OPV, MP, INF, IP)	Yes
Jiménez-Rodríguez* and Sanchez (2005)	9 OECD Countries; Quarterly 1972-2001	VAR (Y, OPV, INF, R, W, EX)	Yes
Gounder and Bartleet (2007)	New Zealand: Quarterly 1989-2006	VAR(INF, R, RER, Y)	Yes
Cong, Wei, Jiao, and Fan (2008)	China. Monthly 1996-2007	VAR(SR, INF, R)	Yes
Kilian and Park (2009a)	USA : Monthly data 1975-2006	VAR(SR)	Yes
Farzanegan and Markwardt (2009)	Developing economies: Iran Quarterly data 1975-2006	VAR(Gov, INF, R, OPV, EX, Co)	Yes
Tang, Wu, and Zhang (2010)	China. Monthly 1998-2008	SVAR(INF, CP, R)	Yes
Mehrara and Mohaghegh (2011)	12 OPEC countries and 8 Non OPEC oil producing countries. Yearly data 1985-2005	VAR(GDP, MS, CP)	Yes
Fowowe and Iwayemi (2011)	Nigeria: Quarterly data 1985Q1 to 2007Q4	VAR(GDP, INF, GOV, NX, RER	NO
Ali Ahmed and Wadud (2011)	Malaysia: Monthly data 1986-2009	SVAR(CPI, Y)	Yes
Emami and Adibpour (2012)	Iran: Annual data 1959-2008	SVAR(GOV, R, RER, Y)	Yes
Omojolaibi (2013)	Nigeria: Quarterly data 1985q1 - 2010q4	SVAR(PR, Y,MS, OP)	Yes
Effiong (2014)	Nigeria: Annual data 1995(1)-2011(12)	SVAR(SP)	Yes

Notes: VAR is Vector Autoregression, Y is economic growth, MP is Monetary Policy, OP is oil prices, IP is import prices, UN is unemployment, W is wages, INF is inflation, R is interest rate, I is investment, OPV is oil price volatility, CP is commodity prices, GOV is Government expenditures, EX is exchange rate., SR is stock returns, CO is consumption, GDP is gross domestic product, NX is net export, RER is Real Exchange rate, CPI is consumer price index, SP is stock price and MS is of variables within the brackets does not reflect the order of the VAR within the above corresponding study.

Table 1 summaries the key literature indicating the data, method and variables used, together with significance of findings.

3. Theoretical Framework:

3.1 Theory

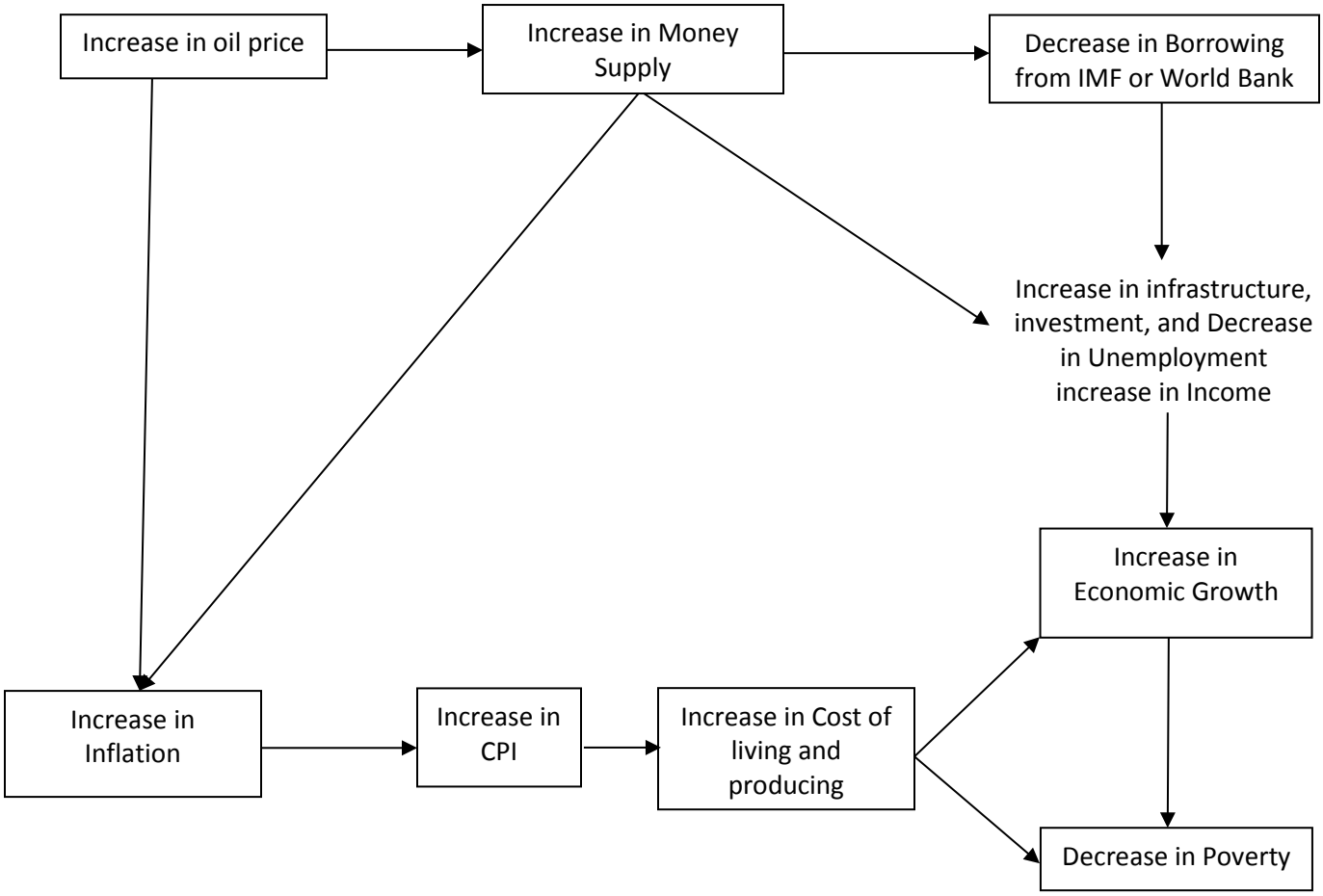
The most persuasive way to achieve poverty reduction in the SSA is through strong macroeconomic growth. Over 40% of the Sub Saharan population lives under extreme poverty. "Higher oil prices exacerbate the incidence and depth of poverty and highly distort income distribution structures" (AFDB 2012). Anyone living under $1.25 a day is considered to be extremely poor (IMF, 2008). The relationship between the prosperity of a nation and its citizens and its wealth in oil rich resources is complex. For oil dependent countries, oil price shocks may lead to a drop in output through two direct effects:

1) resource constraints directly effecting income, and
2) decreased production through higher costs of inputs resulting in the fall of labour income meaning reduction in household income decreasing investment and creating poverty (IMF, 2008).

One may expect positive oil prices shocks to benefit oil exporters. However, the International Monetary Fund asserts that "key economic and social indicators for oil-exporting countries in SSA suggest that oil wealth has not been able to support sustained economic growth and development. Moreover, inequitable distribution of oil revenue among the population can fuel social tensions as has been witnessed in the case of the Niger Delta region" (IMF, 2008).

There should be "basic good governance principles such as strengthened institutions, transparency, accountability and enhanced civil society to enable oil resources to transform into wealth, poverty alleviation, human capital, and institutional development in SSA", which will promote growth and investment in the SSA region.

Figure 2: Theoretical Framework for Exporting Countries (Increase/Decrease)



Source: (Tang, Wu, & Zhang, 2010)

Figure 2 above illustrates the mechanisms of oil price shocks on macroeconomic variables. A brief description of these mechanisms is below:

- Increase in oil price (supply side effect) impacts directly on output due to change in production cost caused by oil shock.
- Inflation impact is the relationship between the a country's inflation and oil prices
- Unemployment and income effect: when output is affected through production cost due to oil price shocks, there is a flow-on impact on employment and income of the population

of that country. Unemployment is the most important factor affecting the poverty rate. Oil shocks causing high levels of unemployment and subsequently the poverty rate.

- Investment effect: Investigating the change in investment caused by oil price shock.
- The relationship between PPI, CPI, profitability, standard of living due to oil price shocks.
- Surpise effect: Volatility and uncertainty about oil prices and its impact on development.

3.2 The Oil price shock transmission channels

Hamilton(1983) defines oil price shocks as "price fluctuations as a result of changes in either the demand or supply side of the international oil market". The oil price shocks themselves can either be a sudden unexpected increase or decrease in price. Although there is a perceived benefit associated with oil price changes, it could have either a positive or negative impact on the macroeconomic variables for both exporting and importing countries. For example, inflation and money supply could be impacted and huge fiscal deficits may result. "The oil price increase can be measured in absolute terms or as a percentage change and the timing of the shock, that is how fast and duration of the price increase" (James D Hamilton, 2003).

Brown and Yücel (2002) theorise that oil price changes affect the performance of macroeconomic variables through transmission channels. When there is oil price shock, "the supply-side impact creates immediate economic distortions that hit oil-intensive production sectors. The supply-side result is the reduced availability of a key production input (oil) when oil prices rise. Because the cost of other production inputs, notably labour, do not fall, the overall per unit cost of production rises, leading to reduced output levels. Since output prices do not necessarily rise with increasing oil prices, the profit margins of oil-intensive production sectors plummet and may have an overall negative effect on the macro economy" (IMF, 2008). Also, "a rise in oil prices leads to deterioration in the terms of trade of net oil-importing countries, and, subsequently, to a fall in the purchasing power of firms and households in net oil-importing countries" and vice versa for oil exporters (IMF, 2008). In turn, this causes decrease in profits and investment for firms, causing higher unemployment, lower income for the household which will lead to poverty for the countries in SSA region.

“Increasing oil prices may lead to increased money demand in net oil-importing countries and failure to meet this demand through increased money supply leads to higher interest rates. This has negative effects on consumption and investment, leading to lower growth. Consumption is affected through its positive relation to disposable income, and investment through increasing firm costs” (Tang et al., 2010). When firms are not investing because of oil price shocks it will have an impact on infrastructural development; with firms or companies not willing to invest in countries with poor infrastructural development, which means lack of job opportunities, this may result in massive unemployment and poverty to the SSA region.

Persistent oil price increases may “lead to a change in the production structure in favour of non-oil intensive sectors, which may lead to other distortions”. When the market reacts to oil price increases it can affect the unemployment situation in the long term. Whilst economic diversification is still low in most SSA economies, oil price shocks have the potential of disrupting the already slow development of these countries.

Oil prices have economic impacts through various channels. Peersman and Van Robays (2009) and Barsky and Kilian (2004) describe the effects of a rising oil prices, grouping them into three main channels: consumer prices, a direct effect; and indirect impacts on consumer prices through production costs and aggregate demand effects. The consumption basket is component of oil products; increases in oil prices directly effects consumer price inflation. Expensive oil raises production costs for firms. If firms decide to partially or totally pass the cost increase onto their consumers by increasing prices of goods, including those not related to energy, this will push up core inflation (indirect effect). The magnitude of these two effects together depends on the country’s relative position in the oil market, i.e. whether the country is a net-importer or net-exporter of oil, its level of oil intensity, and the degree of competition within each industry that is affected by the oil prices.

Oil- and net-food-importing, developing countries were severely affected by food and oil price shocks in 2007 and 2008 creating a negative impact on poverty, growth and inflation

(Naranpanawa & Bandara, 2012). The sharp rise in the global oil price plays a significant role in domestic energy inflation and food inflation in net energy- and food-importing, developing countries, which can impact household poverty. These high prices rises lead to macroeconomic vulnerabilities, particularly in countries with a high share of oil imports, and increase poverty in developing countries, which the SSA region is no exception. Higher oil prices in combination with associated higher import prices tend to increase cost of production leading to reduction of business profitability. In addition, this will unavoidably lead to higher inflation, which will in turn lower the purchasing power of consumers (Kilian and Park, 2009).

Although the above discussion focuses mainly on the impact of positive oil price shocks for oil importing countries, the reverse should be observed for net exporters during price increases. What is not exactly clear is the impact of sudden negative oil price changes on oil exporting countries, particularly after extended periods of price increases that have encouraged excess development funded by international borrowing.

4. Data and Variable Constructions:

Fowowe and Iwayemi (2011) apply 5 macroeconomic variables (as used by Farzanegan & Markwardt, 2009; James D Hamilton, 1983; Mork, 1989), to examine the impact of oil price shocks on macroeconomic variables of the Nigerian economy:

1. Real GDP (Y),
2. Government expenditure (GOV),
3. Inflation (INF),
4. Real exchange rate (RER), and
5. Net exports (NX).

James D Hamilton (2005) points out that the "measure of oil price shocks determines the functional form of the relationship" and this can sometimes create incorrect model specification. This contributes to "inaccurate empirical relationships between oil price shocks and macroeconomic variables". To overcome deficiencies in previous studies, different approaches

like SVAR models are more suitable to test for relationships between oil price shocks and macroeconomic variables.

Mork (1989) examined asymmetries in oil price shocks and found both "positive and negative oil price shocks". Oil price change is defined as follows:

$$ROILP_t^+ = max\big(0, (roilp_t - roilp_{t-1})\big)$$

$$ROILP_t^- = Min\big(0, (roilp_t\_roilp_{t-1})\big)$$

where roilp$_t$ is the real price of oil at time t, $ROILP_t^+$ the real oil price increase, $and\ ROILP_t^-$ the real oil price decrease".

Similarly a GARCH model may be appropriate "to calculate oil price volatility and arrive at an oil shock variable reflecting both the unanticipated component of real oil price movement and the time varying conditional variance of oil price change forecasts". Lee et al. (1995) used the following GARCH (1,1) model to investigate oil shocks:

$$o_t = \delta + \sum_{i=1}^{k} x_i o_{t-i} + \varepsilon_t$$

$$\varepsilon_t = v_t\sqrt{h_t}, v_t \sim N(0,1)$$

$$h_t = \gamma_0 + \gamma_{1\varepsilon_{t-1}^2} + \gamma_{2h_{t-1}}$$

$$OILVOL = Max\left(0, \frac{\varepsilon_t}{\sqrt{h_t}}\right)$$

Lee et al. (1995) defines the "oil volatility measure (OILVOL) for positive (OILVOL$^+$) and negative (OILVOL$^-$) oil shocks, where OILVOL$^+$ contains all positive values of OILVOL and zero replaces negative values and OILVOL$^-$ contains all negative values of OILVOL with positive values replaced by zero".

Al-Rjoub (2005) investigate oil price changes and its effect using VAR analysis, mixed dynamic model and Granger Causality approach. The paper tested for the endogeneity in the model variables and the response of stock returns to oil price shocks in the US economy. Al-Rjoub (2005) use nominal oil price shocks as the only exogenous variable, using the below equation.

$$R_t = R_t 0 + \sum_{i=1}^{n} \alpha_i \; OIL_{t-1} + \sum_{i=1}^{n} \beta_i \, R_{t-1} + \varepsilon_t$$

Where

R_t stands for the S&P 500 returns index.

R_{t-1} is the R_t at different lag length.

OIL_{t-1} is the international crude oil price imported in the U.S

The approach by Al-Rjoub (2005) is use to test for the exogenous variables in the model.

The Al-Rjoub (2005) used a second model called a dynamic model which was written as follows:

$$R_t = b_i D(OIL) + b_2 R_{t-1} + U_t$$

Where

R_t stands for the S&P 500 returns index

R_{t-1} stands for the lag return length

According to Al-Rjoub (2005) with the mixed dynamic model the R_t is "the function of its own lagged value" and the first difference of oil. The second model being a mixed dynamic model performs better than the first difference model. The coefficient of the lag in the mixed dynamic model is exactly equal to one but in the real world it often happens that the coefficient of the lag endogenous variable is statistically different to one, and in those cases mixed dynamic model usually perform better than the specification in first differences.

This research applies the mixed model approach to investigate any lagged endogenous variables.

4.1 Data Issues

The region under study is the net oil exporting countries of Sub-Saharan Africa. Countries included in the sample consist of Angola, Cameroon, Chad, Congo Republic, Cote d'Ivoire, Equatorial Guinea, Gabon, Nigeria, Ghana, and Sudan. Sudan was removed from the analysis due to the fact it is recently emerging from years of civil war and a resultant lack of data availability. Sudan's post war growth rate of 23% causing it to be outlier in the analysis. The time period of analysis uses annual data covering the period 1980 to 2014,

The multivariate model comprises of:

- real oil price (OP) defined as crude oil prices in real terms; and
- real GDP (RGDP) defined as GDP at constant price;
- Unemployment (UNE) measured as percentage of labour force;
- inflation rate (INF) as measured by the percentage changes of consumer price index,
- Investment (inv),
- Real exchange Rate (RER),

Poverty indicators are the poverty index, poverty Gap. The data was obtained from the IMF regional economic outlook database, Bloomberg, World Bank and Quandl websites.

The study uses simple regressions to analyse the relationship between the macroeconomic indicators such as unemployment, inflation and GDP growth and the changes in country poverty indicators. The selected macroeconomic variables used in this study are unemployment, household income, investment, inflation, real exchange rates, interest rates and household poverty. The natural logarithm of the data observations are used. The selection criteria including the sample period as well as choice of countries is based on the data availability for all the needed macroeconomic variables.

5. Estimation Procedure

As the data is time series; the unit root Augmented Dickey-Fuller test is performed to determine if stationarity is a problem in the variables INV, COP, Emp, INF, INC, Corruption and PVTY. Then

a co-integration test was used to determine any long term relationship between the dependent and independent variables in this study. Vector error-correction model (VECM) is used to investigate causality between the variables. The VECM models short-run and long-run relationships (Gujarati, 2012).

5.1 Unit Root Test

The Augmented Dickey-Fuller (ADF) test is used to test for stationarity in the data.

The basic equation for the unit root test is specified as follows:

$$y_t = \alpha + \rho y_{t-1} + \varepsilon_t \quad (2)$$

Where y_t is the time series, t is the time index, α and ρ are the coefficients and ε_t is the error term. The Dickey-Fuller test is based on the following regression forms:

1. Without a Constant term and Trend: $\Delta y_t = \delta y_{t-1} + u_t$ (3)

2. With a Constant term: $\Delta y_t = \alpha + \delta y_{t-1} + u_t$ (4)

3. With a Constant term and Trend: $\Delta y_t = \alpha + \beta_T + \delta y_{t-1} + u_t$ (5)

The null and alternative hypotheses for each of the three cases are as follows:

H_0: $\delta = 0$ (y_t is non-stationary)

H_1: $\delta < 0$ (y_t is stationary)

The decision rule of this test is:

If $\tau >$ DF critical value, we do not reject the null hypothesis, and that means a unit root exists, where τ is the t-statistic.

If $\tau <$ DF critical value, we will reject the null hypothesis, i.e., a unit root does not exist" (Gujarati, 2012).

Separate regressions were run for each equation in order to determine the correct specification.

5.2 Co-integration Test

The SVAR model used to test for co-integration is as follows:

$$AY_t = \beta + \sum_{i=1}^{j} B\, iY_{t-1} + \in_t$$

Where y_t is a g-vector of I(1) variables, μ is a g-vector of constants, and ε_t is a g-vector of white noise residuals at time t with zero mean and constant variance. With macro-economic variables it is likely that they will exhibit a long run relationship or what is technically termed co-integrated. "If the variables are all I(1) and a linear combination of them is I(0), then the variables are co-integrated, that is CI(1,1)" Gujarati, 2012).

The approach by Johansen (1988) and Johanson-Juselius (1990) applied in this study has been developed to "test for any long run relationship between the variables in a regression model". The Akaike Information Criteria determines the "length of lag used to implement the JJ procedure based on the vector autoregressive (VAR)".

5.3 Granger Causality Test.

The Granger approach (1969) tests if the "variable x causes a variable y and how much of the current value of y can be explained by past values of y and if adding past values of x can improve the explanation of y. The variable x is said to Granger cause variable y if past values of x help in the prediction of the present value of y".

As literature suggested by Kilian (2014) and Lee et al. (1995), first run a unit root test to test for the stationarity of the data, run co-integration test to investigate any co-integration among the variables and if there is co-integration among variables then use Vector error correction model(VECM), Granger Causality, impulse response function and variance decomposition but if there is no co-integration then run vector autoregressive model(VAR) Granger causality , impulse response function and variance decomposition for the variables

In the instance there is no co-integration between the variables in the model, the "structural vector autoregressive (SVAR) model is used to examine the short-run causality between the variables" as suggested by Kilian and Park (2009). As specified by Hoffman and Rasche (1996) "the VECM model allows us to capture both the short-run and long-run relationships and the direction of the relationship". The short-run Granger causality can be established by conducting a joint test of the coefficients in the VECM, which is based on the F-test and χ_2 test. The long-run causal relationship, on the other hand, is implied through the significance of the lagged error correction term in the VECM, based on the t test". (Hoffman & Rasche, 1996)

The impact of oil price shocks on macroeconomic variables for oil exporting SSA is analysed using both the impulse response functions and forecast variance decomposition. The impulse response analyses assess the direction, magnitude, timing and duration of shocks in the crude oil market. The forecast variance decomposition decomposes the forecast error variances and estimates the relative importance of various structural shocks. The analysis uses two types of real oil prices for robustness checks.

This paper adopts a model for oil price change developed by (Mork, 1989) and extends it by finding the oil price shock effects. Price shocks effects occur when there is a change in price compared to the previous period as follows:

$$Crude\_oil\_Price\_Shock_t = Crude\_oil\_Price_t - Crude\_oil\_Price_{t-1}$$

5.4 Structural VAR Model

To study the impact of oil price shocks on macroeconomic variables in context to SSA, the Structural Vector Autoregressive model (SVAR) is used in this research. The SVAR model offers a combination of time series analysis and economic theory to find "responses of macroeconomic variables to independent shocks" (Effiong, 2014).

The structural VAR model is used to examine the impact of oil price shocks on macroeconomic variables using the impulse response functions and forecast variance decompositions. Wang et al. (2013) and Effiong (2014) justify the reason for using the SAVR model is appropriate is "that

the results of impulse responses implied by simple VAR model can be affected by the order of variables, SVAR model can help overcome the ordering problem by imposing restrictions on the system according to the importance of variables". The structural VAR Model applied restrictions on the structural parameters where all the zeros restrictions are on the contemporaneous structural parameters, with the direct effect of exogenous variables on the endogenous variables (Gottschalk, 2001).

"The SVAR does not impose restrictions on the lagged structural parameters of the matrix but set restrictions based on economic theory on the macroeconomic variables into mutually orthogonal shocks with structural interpretation when capturing the relationship between variables within a linear framework" (Gottschalk, 2001).

D (OIL) is the first difference in the international crude oil price imported into the US.

$ROILP_t^+$ =(crude oil prices (Cop), employment (EMP), Inflation (INF), investment (inv), Income(Inc), new variables: Corruption and Poverty (Pvty).

$ROILP_t^-$ =(crude oil prices (Cop), employment (EMP), Inflation (INF), investment (inv), Income(Inc), new variables: Corruption, and Poverty (Pvty)

This research applies the following model employed by (Ali Ahmed & Wadud, 2011) which is a SVAR with the following general form:

$$AY_t = \beta + \sum_{i=1}^{j} B\, iY_{t-1} + \in_t$$

Where:

$Y_t = (\Delta GDP_{t,}\Delta inv_t, \Delta\, Pvt_t\Delta, Pts_t, \Delta cor_t, \Delta eml_t, \Delta Roilp_t)$ is a vector including changes in Variables.

GDP_t = the logarithm of Real Gross Domestic Product

inv_t = the logarithm of Investment

Pvt_t = the logarithm of Poverty

Pts_t = the logarithm of Political Stability

cor_t = the logarithm of Corruption

eml_t = the logarithm of Employment.

$Roilp_t$ = the logarithm of real WTI crude oil price

Δ denotes the first order difference between the value in year t-1 and the year t.

$\in_t$ is the exogenous error term in the vector, to be serially and mutually uncorrelated structural shocks.

J is the lag length.

A is the full rank matrix

Following Kilian and Park (2009), the structural shocks, e_t is derived by imposing structural innovations, $e_t = A_0^{-1} e_t$

Based on the underlying sources of oil price shocks, their effect on economic and non-economic variables specified in the structural model form below:

$$\begin{bmatrix} e_t\Delta GDP \\ e_t\Delta inv \\ e_{t\Delta\ PTY} \\ e_{t\Delta}pts \\ e_{t\Delta Cor} \\ e_{t\Delta empl} \\ e_t\Delta Roilp \end{bmatrix} = \begin{bmatrix} a_{11} & 0 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 & 0 & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 & 0 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} & 0 & 0 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & a_{55} & 0 & 0 \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & a_{66} & 0 \\ a_{71} & a_{72} & a_{73} & a_{74} & a_{75} & a_{76} & a_{77} \end{bmatrix}$$

$$\begin{bmatrix} e_t\ oil\ supply\ shocks \\ e_t demand\ shocls \\ e_t\ other\ \ Poverty\ shocks \\ other\ Political\ stablity\ shocks \\ e_t other\ corruption\ shocks \\ e_t other\ employment\ shocks \\ e_t other\ oil\ specfic\ shock \end{bmatrix} \begin{bmatrix} e_t\Delta GDP \\ e_t\Delta inv \\ e_{t\Delta\ PTY} \\ e_{t\Delta}pts \\ e_{t\Delta Cor} \\ e_{t\Delta empl} \\ e_t\Delta Roilp \end{bmatrix}$$

5.5 Results:

This section discusses the results and analysis of the SVAR model used in this study. Table 1 reports the descriptive statistics of the panel data for oil exporting countries in SSA. The Oil price mean for the countries showing higher amplitude, whereas other variables have mean close to zero. The J-B Statistics shows the normality of the panel data. The results show corruption, CPI and Unemployment are negatives, which reflects the changes in these variables have on average declined during the time of the study.

Table 2: Descriptive Statistics

	DOILPRICE	DLINV	DLGDP	DCORRUPTION	DBORROWING	DCPI	DDURABLE	DUN
Mean	2.339	0.074	0.075	-0.022	-0.732	-0.447	0.2061	-0.0633
Median	0.497	0.079	0.082	0.000	-0.459	-0.738	1	0
Max.	31.760	1.231	0.778	1.000	254.475	1722.981	1	4.7
Min.	-35.585	-1.883	-0.747	-1.000	-269.347	-3925.931	-38	-6.8
Std. Dev.	11.298	0.326	0.198	0.290	38.644	306.983	4.339	0.757
Skewness	-0.334	-0.464	-0.201	-0.114	0.358	-7.547	-6.682	-3.003
Kurtosis	6.288	9.430	4.997	8.574	23.184	121.971	49.138	46.457
Jarque-Bera	120.091	448.440	44.793	259.343	4283.087	140822.50	25188.47	14194.05
Prob.	0.000	0.000	0.000	0.000	0.000	0.000	0	0
Sum	598.718	18.977	19.514	-4.417	-184.501	-105.117	54	-11.2
Sum Sq Dev.	32550.310	26.989	10.119	16.722	374831.6	22051801	4912.87	100.771
Observations	256	255	259	200	252	235	262	177

The table reports the descriptive statistics of Oil, Borrowing, corruption, Consumer price index, Durable is Political stability, Investment as Linv which the L denotes the natural log, natural log of GDP and unemployment as UN respectively.

Tests for Stationarity:

The data for the analysis need to be stationary for the correct interpretation of findings. The data should be stationary as non-stationary data generally causes mis-interpretation of results. Time series data in general is typically non-stationary in the observations and needs to be stationary for the right interpretation of results (Enders, 2008). The unit root test checks the stationarity of the data and, while there are many tests for the unit root investigation, this paper analyses panel data using IM, Pesaran and Shin test, Augmented Dickey Fuller (ADF) test and Phillips and Perron PP test (Hoang & McNown, 2006). The IM, Pesaran and Shin test is a standard method when testing for stationarity within panel data. This paper, testing for unit roots, used IM, Pesaran and Shin for the test type, individual root, using individual intercept, Lag length of Automatic selection Schwarz Info Criterion with * for maximum lag.

The result of the unit root tests for the macroeconomic variables for oil exporting countries in SSA are presented in table 3 below. The test shows that all the Borrowing, corruption, investment,

GDP, oil price, political stability (Durable) and unemployment are all non-stationary except the consumer price index (CPI), which is stationary in the observations. Since all the variables from the results are non-stationary at level except CPI and unemployment, the next step is to test for stationary by taking the first differences as shown in table 4. Investment and GDP use the natural logs since the values were large before testing for the stationarity of the variables.

Table 3: IM, Pesaran and Shin test- Level

SSA Oil exporting countries IM, Pesaran and Shin W-stat H0: variable has unit root		
Variables	Intercept	
	t-stat	Prob*
BORROWING	0.237	0.594
CORRUPTION	-1.060	0.145
CPI	-8.656	0.000
LINV	3.146	0.999
LGDP	5.518	1
OILPRICE	6.787	1
DURABLE	-0.765	0.222
UN	-2.645	0.004

** Probabilities are computed assuming asymptotic normality

Table 4: IM, Pesaran and Shin Test- 1st difference

SSA Oil exporting countries Im, Pesaran and Shin W-stat H_0: variable has unit root		
Variables	Intercept	
	t-stat	Prob*
BORROWING	-13.209	0.000
CORRUPTION	-8.359	0.000
CPI	-8.656	0.000
LINV	-14.079	0.000
LGDP	-10.401	0
OILPRICE	-11.809	0
DURABLE	-11.134	0.000
UN	-5.989	0.000

* Probabilities are computed assuming asymptotic normality

Structural VAR Results-Impulse response function and Variance Decomposition

The main reason for the SVAR Framework is to examine any dynamic adjustments of each of the involved variables to exogenous structural shocks (Archanskaïa, Creel, & Hubert, 2012; Kilian & Park, 2009; Papapetrou, 2001). Impulse response functions show the effects of shocks on the adjustment path of the variables. How much each type of shock is contributing to the forecast error variance is measured by the forecast error variance decompositions. Both computations are helpful in determining how shocks to economic variables effect a system. Impulse Response Function of macroeconomic variables (DLINV, DLGDP, DUN, DDURABLE, DCORRUPTION, DBORROWING, and DCPI) shows rate change of one standard deviation in each of Oil prices shocks. "An impulse response function (IRF) traces the effects of a one-time shock to one of the innovations on current and future values of the endogenous variables. If the innovations ε_t is contemporaneously uncorrelated. The innovation ε_i is simply a shock to the $_i$ the endogenous variable y_i, t. contain the impulse response functions for the responses of the macroeconomic variables to different oil price shocks" (Gottschalk, 2001).

Some of the macroeconomic variables shows negative response to oil price shocks whilst others show positive response to oil price changes. For the Investment variables we can infer that it has both positive and negative effects. Investment had positive per cent change in the first lag with 0.03, second lag with 0.03 and third lag with 0.04 and -0.03 for the fourth lag and begins to fade away from the fifth to the tenth lag. In GDP have both positive and negative effects. GDP has positive percent change of 0.10 and 0.001 in the first and second lag respectively, and negative 0.03 in the third lag and positive 0.04 in the fourth lag and begins to fade away in the fifth lag to the tenth lag. The result of IRF showed that the oil price effect on unemployment has a positive impact on the first and second lag. The third lag shows negative effects and fourth lag shows positive effects, then fades away from the sixth lag to tenth lag. The variable which represents political stability has both positive and negative effects. We see the negative effects in the first lag, with -0.020 percent change and the second, third and fourth lags with positive 0.40, 0.30 and 0.40 respectively. The effects fade away from the sixth lag to tenth.

The corruption variables also have both positive and negative effects, the first and second lags have positive effects of 0.05 and 0.03 respectively, and whiles third lag has -0.02 negative effects and fourth lag positive effect of 0.05 and fades away from Fifth to tenth lags.

Although the response of borrowing is statistically insignificant, the effect has a longer duration which would be expected, in the first lag borrowing is -0.02 and in the next lags fades away. The CPI variable is statistically insignificant but shows positive and negative effects, but the impact is indirect after three years, and the effect lasts for four years and then begins to fade away.

Table 5: Oil exporting countries in SSA Panel impulse response functions results

Response of DOILPRICE

Period/Prob	DOILPRICE	DLINV	DLGDP	DCORRUPTION	DBORROWING	DDURABLE	DCPI	DUN
1	13.431	0.000	0.000	0.000	0.000	0.000	0	0.000
Prob	-0.863	0.000	0.000	0.000	0.000	0.000	0	0.000
2	-4.590	0.097	0.760	-1.462	-0.705	-0.551	0.194	-1.080
Prob	-1.283	-1.352	-1.234	-1.310	-1.154	-1.277	-0.382	-1.223
3	-3.618	0.833	-0.217	0.251	-0.888	0.665	-0.619	-0.215
Prob	-1.470	-1.528	-1.202	-1.280	-1.403	-1.138	-0.792	-1.231
4	3.096	-0.425	0.089	0.081	0.444	0.541	-0.199	0.533
Prob	-1.252	-1.186	-0.747	-0.826	-0.680	-0.694	-0.420	-0.828
5	0.759	-0.136	0.089	-0.137	-0.026	-0.124	0.036	-0.289
Prob	-0.945	-0.667	-0.532	-0.694	-0.461	-0.566	-0.344	-0.376
6	-1.464	0.211	0.013	0.125	-0.128	-0.084	-0.084	-0.153
Prob	-0.975	-0.496	-0.262	-0.343	-0.316	-0.361	-0.274	-0.332
7	0.189	0.077	-0.011	0.198	-0.020	0.099	-0.105	0.111
Prob	-0.543	-0.279	-0.194	-0.304	-0.196	-0.223	-0.221	-0.171
8	0.570	-0.107	0.053	-0.036	0.076	-0.028	-0.029	0.034
Prob	-0.560	-0.203	-0.141	-0.161	-0.168	-0.159	-0.123	-0.140
9	-0.235	0.037	0.015	-0.040	-0.041	-0.053	-0.022	-0.069
Prob	-0.345	-0.144	-0.076	-0.126	-0.082	-0.106	-0.113	-0.094
10	-0.172	0.041	0.004	0.018	-0.021	0.022	-0.043	0.010
Prob	-0.267	-0.088	-0.057	-0.086	-0.063	-0.071	-0.099	-0.053

Table 6: Oil exporting countries in SSA Panel impulse response functions results

Response of DLINV

Period	DOILPRICE	DLINV	DLGDP	DCORRUPTION	DDURABLE	DBORROWING	DCPI	DUN
1	0.027	0.299	0.000	0.000	0.000	0.000	0.000	0.000
Prob	-0.027	-0.019	0.000	0.000	0.000	0.000	0.000	0.000
2	0.035	-0.054	0.053	-0.014	0.039	0.0293	0.005	-0.001
Prob	-0.029	-0.031	-0.028	-0.029	-0.029	-0.026	-0.009	-0.027
3	0.041	0.018	-0.023	0.004	0.031	-0.024	-0.015	-0.008
Prob	-0.032	-0.033	-0.026	-0.028	-0.025	-0.030	-0.017	-0.027
4	-0.026	0.003	0.012	-0.007	-0.007	0.018	0.001	-0.004
Prob	-0.022	-0.024	-0.015	-0.017	-0.013	-0.016	-0.010	-0.016
5	0.004	0.004	-0.003	0.020	0.006	-0.009	-0.003	-0.002
Prob	-0.013	-0.013	-0.011	-0.011	-0.010	-0.013	-0.010	-0.009
6	0.009	0.000	0.003	0.003	-0.002	0.005	-0.003	0.003
Prob	-0.012	-0.009	-0.006	-0.006	-0.006	-0.008	-0.007	-0.006
7	-0.001	0.001	0.001	0.000	-0.003	-0.002	-0.001	-0.002
Prob	-0.006	-0.005	-0.004	-0.004	-0.003	-0.005	-0.006	-0.004
8	-0.004	0.001	0.001	0.000	0.000	0.000	-0.002	0.001
Prob	-0.005	-0.003	-0.003	-0.003	-0.002	-0.003	-0.005	-0.002
9	0.002	0.001	0.000	-0.001	0.001	-0.001	-0.001	0.000
Prob	-0.003	-0.002	-0.002	-0.002	-0.001	-0.002	-0.004	-0.001
10	0.001	-0.001	0.001	-0.001	0.000	0.000	-0.001	0.000
Prob	-0.002	-0.001	-0.001	-0.001	-0.001	-0.001	-0.003	-0.001

Table 7: Oil exporting countries in SSA Panel impulse response functions results

Response of DLGDP

Period	DOILPRICE	DLINV	DLGDP	DUN	DDURABLE	DCORRUPTION	DBORROWING	DCPI
1	0.103	0.065	0.155	0.000	0.000	0.000	0.000	0.000
Prob	-0.017	-0.015	-0.010	0.000	0.000	0.000	0.000	0.000
2	-0.032	0.066	-0.002	-0.014	0.019	-0.0020	0.002	-0.012
Prob	-0.019	-0.020	-0.018	-0.018	-0.019	-0.019	-0.017	-0.006
3	0.007	0.032	0.002	-0.002	0.027	-0.010	0.024	0.019
Prob	-0.022	-0.022	-0.018	-0.018	-0.017	-0.020	-0.020	-0.011
4	0.034	-0.004	-0.003	0.002	0.011	0.001	0.006	0.012
Prob	-0.014	-0.016	-0.010	-0.010	-0.010	-0.014	-0.011	-0.008
5	-0.004	0.003	-0.002	-0.003	-0.001	0.005	0.004	0.008
Prob	-0.010	-0.009	-0.007	-0.006	-0.008	-0.010	-0.009	-0.008
6	-0.010	0.003	-0.003	-0.001	-0.002	0.007	0.001	0.007
Prob	-0.009	-0.006	-0.004	-0.003	-0.005	-0.006	-0.005	-0.007
7	0.005	-0.001	-0.002	0.002	-0.002	0.003	0.002	0.005
Prob	-0.006	-0.004	-0.003	-0.002	-0.003	-0.004	-0.003	-0.006
8	0.002	-0.001	-0.001	0.000	-0.002	-0.001	0.001	0.005
Prob	-0.004	-0.002	-0.002	-0.001	-0.002	-0.003	-0.002	-0.004
9	-0.004	0.000	-0.001	0.000	-0.001	-0.001	0.000	0.003
Prob	-0.003	-0.002	-0.002	-0.001	-0.002	-0.002	-0.001	-0.004
10	-0.001	0.000	-0.001	0.001	0.000	-0.001	0.000	0.003
Prob	-0.002	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.003

Table 8: Oil exporting countries in SSA Panel impulse response functions results

Response of DUN

Period	DOILPRICE	DLINV	DLGDP	DUN	DDURABLE	DCORRUPTION	DBORROWING	DCPI
1	-0.024	0.001	0.014	0.581	0.000	0.000	0.000	0.000
Prob	-0.053	-0.053	-0.053	-0.037	0.000	0.0000	0.000	0.000
2	0.083	0.005	0.066	-0.195	0.015	0.022	0.032	-0.033
Prob	-0.057	-0.061	-0.056	-0.054	-0.055	-0.057	-0.050	-0.017
3	-0.018	-0.083	-0.067	0.056	0.012	-0.002	0.043	0.021
Prob	-0.064	-0.067	-0.053	-0.054	-0.050	-0.056	-0.061	-0.034
4	-0.028	0.064	0.001	-0.016	-0.024	0.005	-0.013	0.014
Prob	-0.047	-0.050	-0.032	-0.037	-0.027	-0.029	-0.035	-0.018
5	-0.003	-0.036	0.009	0.014	-0.007	0.010	0.014	0.001
Prob	-0.026	-0.028	-0.023	-0.021	-0.018	-0.021	-0.027	-0.018
6	0.018	0.013	-0.010	-0.003	0.002	0.003	-0.010	0.001
Prob	-0.023	-0.018	-0.014	-0.012	-0.010	-0.011	-0.017	-0.010
7	-0.013	-0.007	0.005	0.001	-0.006	-0.011	0.008	0.003
Prob	-0.014	-0.011	-0.009	-0.008	-0.007	-0.009	-0.012	-0.009
8	-0.001	0.003	-0.003	-0.001	0.003	0.002	-0.005	0.001
Prob	-0.010	-0.007	-0.006	-0.005	-0.004	-0.005	-0.008	-0.007
9	0.003	-0.002	0.001	0.002	0.001	-0.002	0.003	0.001
Prob	-0.007	-0.005	-0.004	-0.003	-0.003	-0.003	-0.005	-0.006
10	0.001	0.000	-0.001	-0.001	0.000	0.000	-0.001	0.001
Prob	-0.004	-0.0031	-0.0023	-0.002	-0.002	-0.002	-0.003	-0.004

Table 9: Oil exporting countries in SSA Panel impulse response functions results

Response of DDURABLE:

Period	DOILPRICE	DLINV	DLGDP	DUN	DDURABLE	DCORRUPTION	DBORROWING	DCPI
1	0.702	0.386	0.341	-0.126	3.906	0.000	0.000	0.000
	-0.361	-0.358	-0.356	-0.355	-0.251	0.0000	0.000	0.000
2	0.289	0.100	-0.235	-0.186	-0.020	-1.151	0.290	-0.128
	-0.385	-0.414	-0.380	-0.377	-0.393	-0.397	-0.344	-0.114
3	0.353	0.004	0.151	-0.099	0.021	0.832	0.417	0.266
	-0.427	-0.444	-0.348	-0.356	-0.341	-0.386	-0.395	-0.220
4	-0.152	0.300	-0.164	-0.012	0.099	0.682	-0.191	0.073
	-0.277	-0.312	-0.199	-0.199	-0.190	-0.267	-0.202	-0.165
5	0.017	-0.053	0.081	0.032	-0.256	0.057	0.178	0.051
	-0.231	-0.194	-0.153	-0.142	-0.158	-0.168	-0.171	-0.142
6	0.109	0.009	-0.026	0.008	-0.106	0.039	-0.013	0.070
	-0.167	-0.121	-0.088	-0.068	-0.104	-0.132	-0.093	-0.117
7	-0.132	0.022	0.001	0.018	-0.030	-0.083	0.014	0.041
	-0.111	-0.075	-0.056	-0.046	-0.065	-0.085	-0.063	-0.080
8	-0.026	-0.004	-0.013	0.004	0.015	-0.060	-0.007	0.025
	-0.072	-0.041	-0.037	-0.026	-0.044	-0.061	-0.037	-0.067
9	0.046	-0.021	-0.011	0.011	0.023	-0.029	0.013	0.023
	-0.052	-0.029	-0.027	-0.020	-0.031	-0.036	-0.023	-0.048
10	-0.008	-0.002	-0.010	-0.007	0.007	-0.006	-0.001	0.021
	-0.033	-0.017	-0.018	-0.011	-0.020	-0.027	-0.015	-0.039

Table 10: Oil exporting countries in SSA Panel impulse response functions results

Response of DCORRUPTION

Period	DOILPRICE	DLINV	DLGDP	DUN	DDURABLE	DCORRUPTION	DBORROWING	DCPI
1	0.052	0.036	0.026	0.006	0.019	0.285	0.000	0.000
Prob	-0.027	-0.026	-0.026	-0.026	-0.026	-0.0184	0.000	0.000
2	0.028	0.024	-0.006	-0.013	-0.027	0.122	-0.002	-0.003
Prob	-0.029	-0.032	-0.029	-0.029	-0.030	-0.030	-0.025	-0.008
3	-0.002	-0.002	0.010	0.003	-0.063	0.008	0.021	0.009
Prob	-0.032	-0.033	-0.026	-0.026	-0.026	-0.030	-0.028	-0.015
4	-0.018	0.011	0.002	0.004	-0.020	-0.008	-0.005	0.005
Prob	-0.016	-0.021	-0.013	-0.009	-0.014	-0.025	-0.015	-0.016
5	-0.010	0.001	0.001	0.005	0.002	-0.022	0.000	0.000
Prob	-0.016	-0.013	-0.008	-0.007	-0.011	-0.014	-0.011	-0.013
6	0.007	-0.003	-0.001	0.001	0.007	-0.016	0.000	0.001
Prob	-0.008	-0.007	-0.005	-0.004	-0.008	-0.010	-0.005	-0.011
7	0.001	-0.002	-0.001	-0.001	0.005	-0.005	0.000	0.001
Prob	-0.006	-0.004	-0.004	-0.003	-0.005	-0.007	-0.003	-0.008
8	-0.002	0.000	-0.001	-0.001	0.003	0.002	-0.001	0.001
Prob	-0.004	-0.003	-0.003	-0.002	-0.004	-0.006	-0.002	-0.006
9	0.002	0.000	0.000	0.000	0.000	0.003	0.001	0.001
Prob	-0.002	-0.002	-0.002	-0.001	-0.003	-0.004	-0.001	-0.004
10	0.001	0.000	0.000	0.000	-0.001	0.002	0.000	0.001
Prob	-0.002	-0.001	-0.001	-0.001	-0.002	-0.002	-0.001	-0.004

Table 10: Oil exporting countries in SSA Panel impulse response functions results

Response of DCORRUPTION

Period	DOILPRICE	DLINV	DLGDP	DUN	DDURABLE	DCORRUPTION	DBORROWING	DCPI
1	-1.504	0.288	-7.354	-0.444	-0.464	-2.670	25.517	0.000
Prob	-2.429	-2.427	-2.380	-2.333	-2.333	-2.3260	-1.640	0.000
2	0.068	5.622	-3.385	1.800	-1.502	1.748	-1.879	4.490
Prob	-2.579	-2.753	-2.491	-2.464	-2.570	-2.638	-2.334	-0.813
3	-1.691	-3.645	2.775	2.053	-2.221	0.937	2.551	-1.976
Prob	-2.861	-2.966	-2.304	-2.354	-2.234	-2.555	-2.656	-1.485
4	0.910	1.326	-0.902	-0.598	-0.224	1.032	-1.630	-1.292
Prob	-1.813	-2.061	-1.291	-1.323	-1.196	-1.696	-1.395	-1.063
5	-0.681	-0.596	0.838	0.508	-0.580	-1.182	0.987	-0.786
Prob	-1.291	-1.198	-0.959	-0.906	-0.922	-0.969	-1.197	-0.963
6	0.098	0.394	0.021	-0.252	0.258	-0.114	-0.783	-0.806
Prob	-0.862	-0.763	-0.600	-0.548	-0.496	-0.620	-0.732	-0.662
7	0.016	-0.161	0.335	0.150	0.220	-0.293	0.172	-0.695
Prob	-0.541	-0.493	-0.425	-0.375	-0.318	-0.423	-0.553	-0.565
8	0.221	0.166	0.104	-0.163	0.190	0.059	-0.265	-0.532
Prob	-0.433	-0.333	-0.281	-0.226	-0.222	-0.319	-0.355	-0.405
9	0.014	-0.021	0.187	0.005	0.071	0.064	0.018	-0.437
Prob	-0.245	-0.217	-0.197	-0.153	-0.148	-0.207	-0.250	-0.348
10	0.071	0.115	0.099	-0.065	0.049	0.126	-0.121	-0.352
Prob	-0.176	-0.156	-0.142	-0.108	-0.105	-0.131	-0.171	-0.265

Table 11: Oil exporting countries in SSA Panel impulse response functions results

Response of DBORROWING

Period	DOILPRICE	DLINV	DLGDP	DUN	DDURABLE	DCORRUPTION	DBORROWING	DCPI
1	-1.504	0.288	-7.354	-0.444	-0.464	-2.670	25.517	0.000
	-2.429	-2.427	-2.380	-2.333	-2.333	-2.3260	-1.640	0.000
2	0.068	5.622	-3.385	1.800	-1.502	1.748	-1.879	4.490
	-2.579	-2.753	-2.491	-2.464	-2.570	-2.638	-2.334	-0.813
3	-1.691	-3.645	2.775	2.053	-2.221	0.937	2.551	-1.976
	-2.861	-2.966	-2.304	-2.354	-2.234	-2.555	-2.656	-1.485
4	0.910	1.326	-0.902	-0.598	-0.224	1.032	-1.630	-1.292
	-1.813	-2.061	-1.291	-1.323	-1.196	-1.696	-1.395	-1.063
5	-0.681	-0.596	0.838	0.508	-0.580	-1.182	0.987	-0.786
	-1.291	-1.198	-0.959	-0.906	-0.922	-0.969	-1.197	-0.963
6	0.098	0.394	0.021	-0.252	0.258	-0.114	-0.783	-0.806
	-0.862	-0.763	-0.600	-0.548	-0.496	-0.620	-0.732	-0.662
7	0.016	-0.161	0.335	0.150	0.220	-0.293	0.172	-0.695
	-0.541	-0.493	-0.425	-0.375	-0.318	-0.423	-0.553	-0.565
8	0.221	0.166	0.104	-0.163	0.190	0.059	-0.265	-0.532
	-0.433	-0.333	-0.281	-0.226	-0.222	-0.319	-0.355	-0.405
9	0.014	-0.021	0.187	0.005	0.071	0.064	0.018	-0.437
	-0.245	-0.217	-0.197	-0.153	-0.148	-0.207	-0.250	-0.348
10	0.071	0.115	0.099	-0.065	0.049	0.126	-0.121	-0.352
	-0.176	-0.156	-0.142	-0.108	-0.105	-0.131	-0.171	-0.265

Table 12: Oil exporting countries in SSA Panel impulse response functions results

Response of DCPI

Period	DOILPRICE	DLINV	DLGDP	DUN	DDURABLE	DCORRUPTION	DBORROWING	DCPI
1	0.824	-3.855	-1.767	0.089	0.961	0.478	-3.455	22.172
Prob	-2.079	-2.064	-2.045	-2.042	-2.041	-2.0402	-2.028	-1.425
2	-0.958	-1.823	-5.556	-0.017	0.536	0.574	3.396	14.217
Prob	-2.543	-2.689	-2.492	-2.455	-2.536	-2.590	-2.361	-1.121
3	-1.950	0.009	-5.166	0.218	-1.769	-0.926	2.589	14.437
Prob	-3.013	-3.089	-2.596	-2.608	-2.673	-2.949	-2.721	-1.483
4	-1.273	-2.048	-3.584	1.095	-1.527	-0.274	2.405	11.373
Prob	-1.927	-2.549	-2.078	-1.922	-2.241	-2.877	-2.288	-1.562
5	-1.127	-1.029	-3.425	0.637	-1.204	-0.531	1.346	9.110
Prob	-1.636	-2.291	-1.878	-1.720	-1.993	-2.503	-2.235	-1.819
6	-1.395	-1.273	-2.545	0.627	-1.164	-0.954	1.515	7.465
Prob	-1.468	-1.893	-1.490	-1.335	-1.596	-2.041	-1.770	-1.964
7	-0.889	-0.919	-2.236	0.480	-0.739	-0.657	0.949	6.040
Prob	-1.123	-1.578	-1.284	-1.127	-1.248	-1.534	-1.553	-1.994
8	-0.745	-0.841	-1.750	0.430	-0.599	-0.637	0.901	4.898
Prob	-0.881	-1.293	-1.080	-0.915	-0.979	-1.173	-1.251	-1.964
9	-0.617	-0.655	-1.455	0.296	-0.477	-0.458	0.658	3.978
Prob	-0.734	-1.050	-0.925	-0.741	-0.770	-0.907	-1.051	-1.872
10	-0.512	-0.549	-1.171	0.267	-0.391	-0.350	0.569	3.227
Prob	-0.613	-0.862	-0.798	-0.605	-0.630	-0.741	-0.859	-1.748

Oil exporting countries in SSA Panel impulse response functions results graph

Figure 3: Response to Structure One S.D. Innovations

Table 13: Variance Decomposition of OILPRICE

Variance Decomposition Table Results

Period	S.E.	DOILPRICE	DLINV	DLGDP	DUN	DDURABLE	DCORRUPTION	DBORROWING	CPI
1	13.322	100.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	16.457	96.586	2.452	0.040	0.452	0.000	0.073	0.050	0.347
3	19.610	94.710	3.536	0.034	0.936	0.301	0.105	0.120	0.258
4	22.450	92.803	4.037	0.083	1.731	0.707	0.154	0.251	0.233
5	25.256	90.831	4.165	0.229	2.674	1.216	0.204	0.473	0.208
6	28.122	88.665	4.211	0.512	3.735	1.681	0.238	0.761	0.196
7	31.138	86.170	4.326	0.962	4.882	2.099	0.254	1.116	0.192
8	34.369	83.334	4.575	1.597	6.086	2.458	0.249	1.507	0.193
9	37.877	80.187	4.966	2.416	7.314	2.778	0.231	1.911	0.198
10	41.707	76.831	5.465	3.400	8.525	3.069	0.205	2.302	0.203

Table 14: Variance Decomposition ofDLINV

Period	S.E.	DOILPRICE	DLINV	DLGDP	DUN	DDURABLE	DCORRUPTION	DBORROWING	CPI
1	0.259	1.454	98.546	0.000	0.000	0.000	0.000	0.000	0.000
2	0.413	1.824	96.647	0.001	0.771	0.001	0.287	0.043	0.425
3	0.500	2.086	94.594	0.042	1.798	0.129	0.395	0.184	0.772
4	0.542	2.339	92.002	0.267	3.029	0.397	0.395	0.450	1.122
5	0.564	2.453	88.991	0.820	4.343	0.731	0.370	0.882	1.410
6	0.579	2.442	85.771	1.794	5.600	1.009	0.352	1.422	1.609
7	0.593	2.356	82.457	3.196	6.726	1.207	0.339	1.992	1.728
8	0.607	2.248	79.134	4.954	7.706	1.337	0.325	2.508	1.788
9	0.622	2.152	75.884	6.943	8.544	1.434	0.309	2.922	1.811
10	0.638	2.086	72.809	9.012	9.248	1.525	0.296	3.212	1.813

Table 15: Variance Decomposition of DLGDP

Period	S.E.	DOILPRICE	DLINV	DLGDP	DUN	DDURABLE	DCORRUPTION	DBORROWING	CPI
1	82.406	0.004	0.152	99.844	0.000	0.000	0.000	0.000	0.000
2	120.355	0.076	0.260	80.241	7.227	4.383	0.144	7.588	0.080
3	142.942	0.229	0.698	80.594	8.766	3.671	0.107	5.879	0.057
4	160.790	0.627	1.551	78.913	9.053	4.480	0.093	5.217	0.065
5	173.736	0.991	2.884	77.941	8.956	4.545	0.112	4.512	0.059
6	183.523	1.469	4.102	76.523	8.710	4.956	0.129	4.053	0.057
7	190.399	2.000	5.014	75.297	8.439	5.270	0.144	3.782	0.054
8	195.105	2.647	5.520	74.136	8.183	5.664	0.148	3.650	0.052
9	198.221	3.398	5.724	73.079	7.968	5.996	0.147	3.637	0.051
10	200.386	4.264	5.743	72.035	7.799	6.278	0.144	3.688	0.050

Table 16: Variance Decomposition of DUNE

Period	S.E.	DOILPRICE	DLINV	DLGDP	DUNE	DDURABLE	DCORRUPTION	DBORROWING	CPI
1	0.207	23.069	0.029	0.745	76.158	0.000	0.000	0.000	0.000
2	0.294	15.004	0.298	0.413	80.214	3.841	0.043	0.170	0.019
3	0.366	12.182	0.919	0.266	79.958	6.197	0.159	0.308	0.012
4	0.431	10.136	2.043	0.193	79.167	7.882	0.299	0.260	0.020
5	0.493	8.661	3.394	0.164	78.159	8.917	0.476	0.201	0.028
6	0.553	7.541	4.708	0.189	77.019	9.656	0.668	0.178	0.042
7	0.612	6.678	5.859	0.308	75.860	10.147	0.865	0.223	0.061
8	0.672	6.016	6.810	0.567	74.628	10.481	1.056	0.356	0.087
9	0.733	5.512	7.590	1.015	73.271	10.683	1.238	0.570	0.121
10	0.796	5.143	8.239	1.684	71.727	10.785	1.408	0.854	0.160

Table 17: Variance Decomposition of DDURABLE

Period	S.E.	DOILPRICE	DLINV	DLGDP	DUN	DDURABLE	DCORRUPTION	DBORROWING	CPI
1	0.284	0.395	0.139	0.005	19.656	79.806	0.000	0.000	0.000
2	0.370	1.762	0.109	0.250	24.218	69.928	1.033	2.441	0.261
3	0.440	3.637	0.474	1.252	26.342	64.376	1.888	1.832	0.201
4	0.492	5.264	1.444	2.064	28.914	57.784	2.864	1.489	0.179
5	0.542	6.893	2.499	2.340	31.245	51.904	3.571	1.401	0.148
6	0.592	8.372	3.514	2.112	33.769	46.366	4.089	1.653	0.124
7	0.646	9.744	4.370	1.782	36.075	41.208	4.355	2.355	0.110
8	0.707	10.948	5.148	1.825	37.973	36.288	4.427	3.286	0.106
9	0.777	11.960	5.891	2.545	39.173	31.677	4.329	4.313	0.113
10	0.859	12.773	6.642	4.005	39.619	27.480	4.118	5.234	0.129

Table 18: Variance Decomposition of Corruption

Period	S.E.	DOILPRICE	DLINV	DLGDP	DUN	DDURABLE	DCORRUPTION	DBORROWING	CPI
1	3.929	0.801	1.063	0.000	1.238	1.867	95.032	0.000	0.000
2	5.338	0.804	0.588	0.017	1.044	4.079	93.469	0.001	0.000
3	6.283	0.647	0.433	0.059	1.085	6.166	91.587	0.006	0.017
4	6.995	0.612	0.739	0.097	1.128	8.169	89.167	0.057	0.032
5	7.561	0.673	1.597	0.116	1.151	9.634	86.608	0.184	0.037
6	8.027	0.866	2.630	0.111	1.169	10.598	84.163	0.429	0.034
7	8.416	1.215	3.428	0.103	1.204	11.167	82.046	0.806	0.031
8	8.751	1.750	3.828	0.144	1.276	11.490	80.158	1.324	0.031
9	9.057	2.493	3.878	0.319	1.405	11.651	78.249	1.973	0.033
10	9.358	3.462	3.715	0.729	1.607	11.696	76.025	2.728	0.039

Table 19: Variance Decomposition of DBORROWING

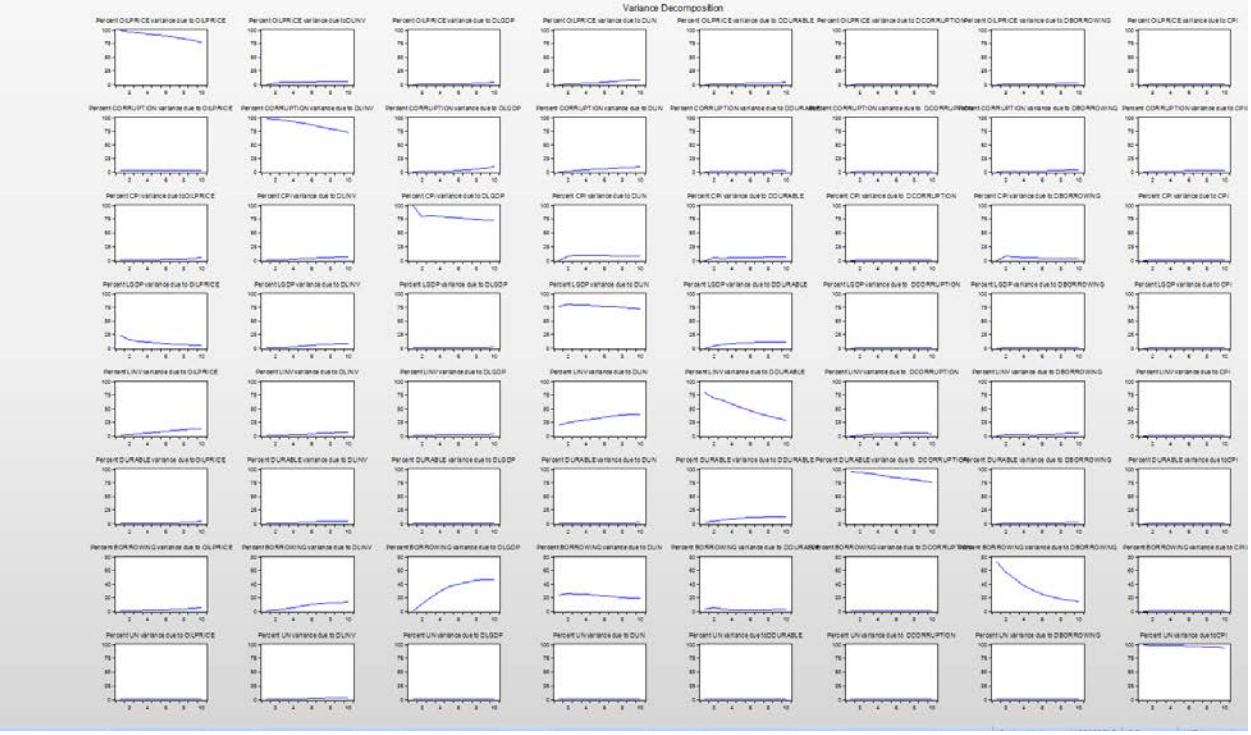
Period	S.E.	DOILPRICE	DLINV	DLGDP	DUN	DDURABLE	DCORRUPTION	DBORROWING	CPI
1	32.270	0.727	0.212	0.148	23.656	2.830	0.208	72.219	0.000
2	46.953	0.778	1.247	9.305	25.414	5.393	0.369	57.474	0.021
3	63.632	1.048	3.092	19.940	24.911	3.039	0.346	47.551	0.074
4	81.097	1.264	5.586	29.246	24.039	1.872	0.391	37.525	0.076
5	99.341	1.580	7.810	35.577	22.870	1.446	0.425	30.213	0.080
6	117.223	1.951	9.633	39.946	21.789	1.416	0.462	24.727	0.076
7	134.266	2.432	10.937	42.799	20.825	1.686	0.486	20.764	0.073
8	149.987	3.028	11.825	44.676	20.001	2.074	0.502	17.823	0.071
9	164.230	3.768	12.382	45.823	19.287	2.542	0.508	15.620	0.071
10	176.948	4.667	12.704	46.427	18.661	3.029	0.509	13.931	0.072

Table 20: Variance Decomposition of DCPI

Period	S.E.	DOILPRICE	DLINV	DLGDP	DUN	DDURABLE	DCORRUPTION	DBORROWING	CPI
1	0.603	0.108	0.296	0.220	0.204	0.109	0.073	0.123	98.869
2	0.758	0.500	0.188	0.160	0.244	0.130	0.096	0.127	98.557
3	0.899	0.357	0.357	0.177	0.224	0.239	0.235	0.092	98.319
4	1.022	0.282	0.732	0.198	0.189	0.233	0.352	0.098	97.916
5	1.132	0.231	1.288	0.245	0.161	0.233	0.491	0.092	97.261
6	1.235	0.203	1.879	0.293	0.137	0.214	0.636	0.091	96.547
7	1.331	0.196	2.410	0.341	0.119	0.195	0.796	0.086	95.857
8	1.421	0.205	2.849	0.380	0.104	0.175	0.969	0.081	95.236
9	1.506	0.229	3.197	0.410	0.093	0.156	1.155	0.075	94.685
10	1.586	0.264	3.475	0.429	0.084	0.141	1.347	0.070	94.189

Source: Output software Eviews

Figure 4: Variance Decomposition (Combined Graph)



Variance Decomposition Results

"Variance decomposition (VD) describes the percentage of the forecast error variance of a variable that is attributable to its own innovations and other variables" (Bouchaour, Cherifa and Hussein Ali Al-Zeaud 2012). The above tables and graphs show that the macroeconomic variables respond to oil price shocks consistent with prior studies. The result of VD above indicate that the largest source of shocks was changes in the oil price (OP) itself; which contributed about 100% in 1st year declining to 77% in tenth year.

Variance Decomposition of DLINV: the largest source of shocks was changes in DLINV itself, contributing 99% in the first year and declining in the tenth year to 73% see the table above.

For DLGDP; the largest source of shocks was changes in RGDP itself; which contributed about 99.84 per cent in the first year; diminishing to about 72% percent in the last year. The contribution of oil prices shocks significantly affects GDP in oil exporting SSA countries in the long-run more than the short-run. The contributions of oil prices in GDP are very high and that

emphasizes the fact that oil price shocks are necessary, sufficient to explain changes that occurred in GDP for oil exporting countries in SSA (Farzanegan & Markwardt, 2009).

Unemployment 76.1% rate in the first year; declining to 73.2% per cent in the tenth year, however oil price changes in unemployment in first year to the tenth year, the marginal of decrease was less than 2.31%. The findings shows that oil price shocks do impact unemployment (Doğrul & Soytas, 2010).

Durable, which is political stability, in the first year is 80% decreasing to 27% in the tenth year. As mentioned earlier, African oil exporting countries are among the most corrupt countries in the world, suffering from political instability, violence and civil war. Ian Gary (2003) states that: "Fights over oil revenues become the reason for intensifying up the level of pre-existing conflict in a society, and oil may even become the very rationale for starting wars. Petroleum revenues are also a central mechanism for prolonging violent conflict and only rarely a catalyst for resolution. Example, of Sudan, the Republic of Congo, and Nigeria" (African Development Bank, 2009).

Corruption is the use of official position for selfish enrichment to the detriment of the citizens or the people they serve. In Africa, especially oil exporting countries in the SSA region, corruption is omnipresent. Corruption deceives in its ability to influence the very roots of an economy, and has significant impact for both efficiency and equity. It strains political institutions and thus also threatens democracy and the social, political, and economic benefits attributed to it. It is often undertaken in secret and consequently complicates the nature of economic exchange (Edgardo Campos, Lien, & Pradhan, 1999; Fisman & Gatti, 2002; Mauro, 1998). 96% of variation in oil price is explained by corruption in the first year, decreasing to 76% of variation explained in the tenth year. Corruption impedes growth, investment and breeds poverty in SSA.

Borrowing shows that 76% of variations where related to changes in oil price shocks and decreasing to 14% in the tenth year, whiles as CPI had 99% variation explained by oil price changes declining to 94% in the tenth year. This confirms that CPI is significant with oil price shocks in SSA Oil exporting countries.

Correlation Test:

The next section of the analysis investigates whether there is association between the oil price, borrowing and corruption of the oil exporting countries in SSA. According to (Kao, 1999), to establish whether a relationship or association exists among three variables (i.e. if there is correlation or not), the first rule is that if the relationship or association is not known then we use two tailed test, but if we know one association then one tailed test could be used. In this study the relationship or association between oil price and borrowing for the oil exporting

countries in SSA is examined. Since we do not know the relationship and from literature if the relationships are not known, then two tailed test must be used to test for the relationship or association. In this study, the SPSS Pearson Correlation model is used to test for the relationship between Oil price, borrowing and corruption using two tailed test.

Null Hypothesis: There is no relationship or association between Oil prices, Corruption and borrowing

Alternative Hypothesis: There is a positive relationship or association between oil prices, corruption and borrowing

If the Sig/P value is less than 5 per cent we reject the null hypothesis and accept the alternative hypothesis, if the sig/p value is more than 5 per cent we do not reject null hypothesis. So from the results below the Sig/P value for borrowing is 0.000 and corruption is 0.002 which are each less than 5 per cent. Therefore we reject null hypothesis, meaning there is a relationship or association among oil prices, borrowing and corruption.

The relationship between corruption and borrowing was tested to see if there is correlation among them or not

Null Hypothesis: There is no relationship or association between Corruption and borrowing

Alternative Hypothesis: There is relationship or association between corruption and borrowing and the results below:

Table 21: Correlations (Oil Price, Borrowing and Corruption)

		Oil Price	Borrowing	Corruption
Oil Price	Pearson Correlation	1	-.418**	-.212**
	Sig. (2-tailed)		0	0.002
	N	264	254	201
Borrowing	Pearson Correlation	-.418**	1	.511**
	Sig. (2-tailed)	0		0
	N	254	261	199
Corruption	Pearson Correlation	-.212**	.511**	1
	Sig. (2-tailed)	0.002	0	
	N	201	199	207

**. Correlation is significant at the 0.01 level (2-tailed).

Table 21 shows the correlations between the Oil Price, Borrowings, and Corruption. The correlations between the Oil Price, and Borrowing and Corruption are significant at the 99 per

cent level for the two tailed test. The Sig/P value for borrowing and corruption are 0.000 and 0.000 respectively, therefore we reject the null hypothesis because there is enough statistical evidence to conclude that there is a correlation or relationship among the three variables. The correlation test above are for the missing data and for robustness check I will use the forecasted data (FD) to test for correlation among Oil price, borrowing and corruption and see if I may get different results or otherwise.

Correlation Test for Forecasted Data for Robustness check

Null Hypothesis: There is no relationship or association between Oil prices, Corruption and borrowing

Alternative Hypothesis: There is relationship or association between oil prices, corruption and borrowing

The results in Table 22 the Sig/P value for borrowing is .000 and corruption is .002 which is all less than 5 percent. Therefore we reject null hypothesis, meaning there is relationship or association among oil prices, borrowing and corruption. The correlation is significant at 99 percent level for the two tailed test.

Table 22: Correlations (Oil Price Corruption and Borrowing) FD

		Oil Price	Corruption	Borrowing
Oil Price	Pearson Correlation	1	-.183**	-.397**
	Sig. (2-tailed)		0.002	0.000
	N	280	280	280
Corruption	Pearson Correlation	-.183**	1	.459**
	Sig. (2-tailed)	0.002		0.000
	N	280	280	280
Borrowing	Pearson Correlation	-.397**	.459**	1
	Sig. (2-tailed)	0.000	0.000	
	N	280	280	280

**. Correlation is significant at the 0.01 level (2-tailed).

The Sig/P value for borrowing and corruption are .000 and .000 respectively, therefore reject the null and therefore concluded that there is correlation or relationship among the three variables. The correlation is significant at 99 percent level for the two tailed test. Both missing data and forecasted data values are given the same results though we forecasted the missing data using multiple imputations by applying ARMA model. (Humphries, 2013)

Robustness Check

For robustness check a test for the unit root for missing data and forecasted data was performed and the results were similar, also the descriptive statistics results for the missing data and forecasted data was the same. The forecasted came about since countries in Angola and South Sudan have been in war and as results there were no data for most of the macroeconomic variables, so I employed the advanced technique of ARMA model to fill in the missing data. I tested also for the impulse response function and variance decomposition for the forecasted data as well as correlation test. The results are almost similar (see Appendix for the forecasted results). This proved that the robustness of the results was checked in the study.

Comparative Analysis

Mork (1989) empirically estimated macroeconomic impacts and found the "oil price effects were stronger and more frequently statistically significant in the multivariate analyses than in the bivariate". In Mork's study "countries except Norway experienced negative relationships between oil price increases and GDP growth. The significance level was weakened somewhat for Germany in the multivariate case but was strengthened for Canada and France. In the multivariate estimation, the U.S., Canada (both at the 2% level), Japan (at 3%), and Germany (at 10%) demonstrated significant evidence of asymmetry". They "estimated regressions of GDP on only contemporaneous and lagged oil prices as well as multivariate regressions which included also the inflation rate (measured by the GDP deflator), short-term interest rates, the unemployment rate, and the growth rate of industrial production for the entire OECD as a proxy for exogenous export demand".

Jiménez-Rodríguez and Sanchez (2005) found that an increased in oil prices has a significant negative impact on the GDP growth in all oil importing countries except Japan. The GDP results in this study show that oil price shocks positively affects the GDP of oil exporting countries in SSA. The impact persist for one period using impulse response function and is significant.

Umar and Kilishi, (2010) examined the "impact of crude oil price changes on four key macroeconomic variables over the period 1970 to 2008. A VAR analysis showed that oil prices have significant impact on real GDP, money supply and unemployment". However, there appears to be an insignificant impact on consumer price index. This suggest that only three key macroeconomic variables in Nigeria are significantly explained by exogenous oil shocks. The results on employment and CPI are positively affected by oil price shocks. In this study, CPI was

contrary to the findings of the above, however, vulnerability to external shocks appears to exist for the SSA countries in this study. Farzanegan and Markwardt (2009) investigate the dynamic relationship between oil price shocks and major macroeconomic variables in Iran over the period 1975to 2006 by applying a VAR approach. Their results indicate there is a positive asymmetric effect of oil price shocks on industrial output.

Fowowe and Iwayemi (2011) conducted an "empirical analysis of the effects of oil price shocks on a SSA oil-exporter Nigeria. The study found that oil price shocks do not have a major impact on most macroeconomic variables in Nigeria over the period 1985: Q1 to 2007: Q4. The results of the Granger-causality tests, impulse response functions; and variance decomposition analysis all showed that different measures of linear and positive oil shocks have not caused output; government expenditure; inflation; and the real exchange rate. The tests support the existence of asymmetric effects of oil price shocks due to the fact that negative oil price shocks significantly affect output and the real exchange rate".

6. **Conclusions and Policy implications**

The objective of the study was to examine the impact of oil price shocks on macroeconomic variables of SSA oil exporting countries. The study also investigates the relationship between oil price, corruption and borrowing pattern in these oil exporting countries. There are many empirical studies on the impact of oil price shocks on economies which are either exporting or importing countries. (Elder & Serletis, 2009; Kilian & Park, 2009; Omojolaibi, 2013; Peersman & Van Robays, 2012). Most of these countries are developed economies and few emerging economies but little studies on Africa. The Sub Saharan African oil exporting countries was chosen for this study due to oil being the major revenue for these countries but yet their citizenry are living in massive poverty. Secondly most developed oil exporting countries have used these oil revenues to increase investments, capital inflow, developed their infrastructural to improve the standard of living for its population while the oil exporting SSA countries have massive corruption, low standard of living, lack of investments and infrastructure development. A combination of models and variables of different studies was employed in the study including the SVAR Model, impulse response function and variance decomposition. The results from the impulse response function showed that Investment, GDP, corruption and unemployment are affected by oil price shocks. Variance Decomposition exhibited the same results as impulse response function, portion of oil price shock and is present in the investment, GDP, corruption and unemployment for these oil exporting countries.

The oil prices fluctuations have an indirect positive effect on GDP that are explained by the increase in oil prices causing a higher cash income; and this will affect all the components of GDP; so that encourage foreign investors to settle their investment in the country. Investment should

increase capital inflow to these oil exporting countries to promote growth and increase employment.

Corruption need to be checked or controlled as it erodes investors' confidence to invest in countries with low corruption index like Nigeria. Countries in oil exporting countries should invest in human capital, build infrastructural, and create independent institutions that will deal with corrupt public officials who steal oil revenues.

Future research is required to be undertaken to study further the impact of oil price shocks on the borrowing pattern of oil exporting countries in SSA by employing other important macroeconomic variables such as exchange rate and monetary policy. Exchange rate is important because when the oil price increases, government revenue will increase, which will lead to national currency appreciation and lead to massive development in the SSA region.

7. Contribution:

This study contributes to the existing empirical literature by incorporating some new variables of Borrowing, corruption and Political stability due to the nature of problems relating to the SSA region. The new variables might not be an issue for previous studies focusing on developed countries however they are a major problem in SSA.

The research contributes to the empirical literature on the impact of oil price shocks on macroeconomic variables of all oil exporting and selected importing countries in SSA, where there is no evidence of any such research done relating to SSA in this context.

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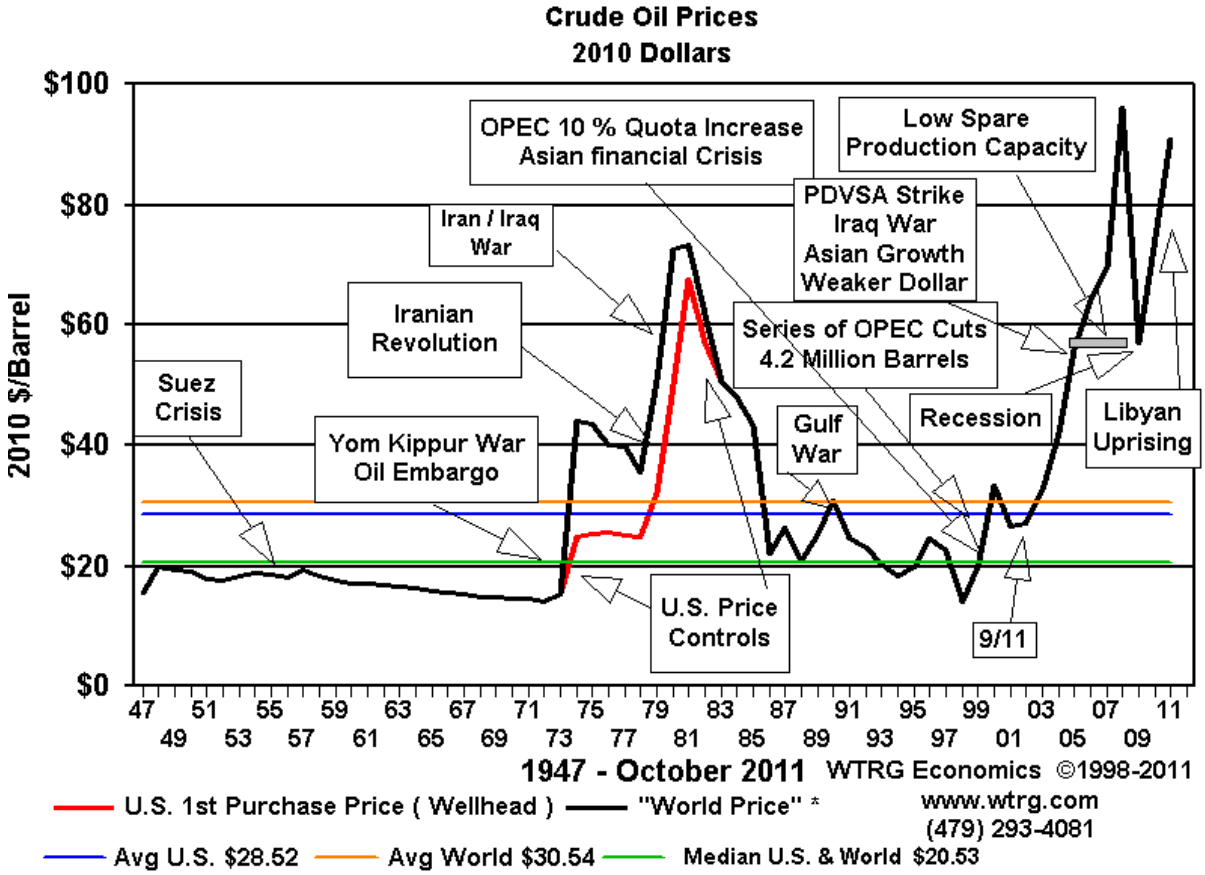
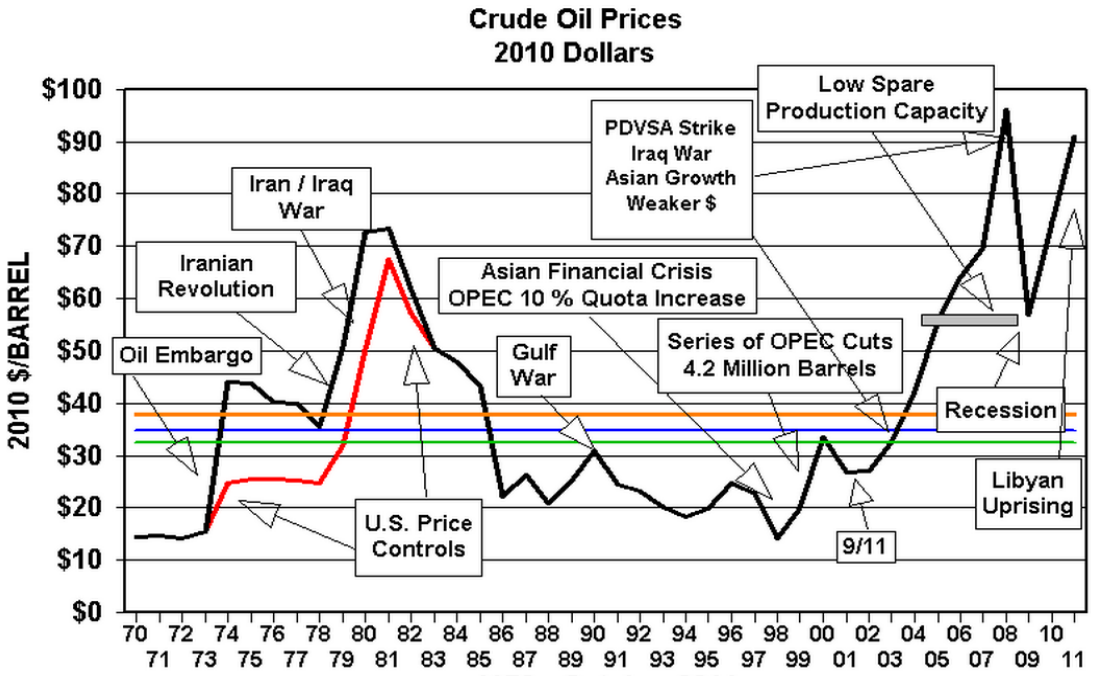
Figure 5: Crude Oil Prices 1947 - October 2011



Source: **www.wtrg.com/graph/2010**

Figure 6: Crude Oil Prices 1970 - October 2011



Source of the above Graph: www.wtrg.com/graph/2010

Appendix: Forecasted values for Robustness check:

Table 23: Descriptive Statistics

	DOILPRICE	DLINV	DLGDP	DDURABLE	DCPI	DCORRUPTION	DBORROWING	DUN
Mean	3.018	0.075	0.063	0.193	- 1.145	- 0.000	- 0.692	0.047
Median	0.414	0.076	0.081	1.000	- 0.762	0.000	- 0.278	0.044
Maximum	111.670	1.231	0.778	1.387	1,722.981	2.000	254.475	7.000
Minimum	- 35.585	- 1.883	- 2.849	- 38.000	- 3,925.931	- 1.000	- 269.347	- 6.800
Std. Dev.	14.416	0.333	0.269	4.262	285.349	0.287	37.225	0.758
Skewness	2.914	- 0.520	- 4.720	- 6.778	- 8.104	1.007	0.368	0.642
Kurtosis	25.987	9.029	52.505	50.714	140.915	15.458	24.931	57.437
Jarque-Bera	6,373.388	424.163	28,784.820	27,884.240	218,544.900	1,804.850	5,457.201	33,603.240
Probability	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sum	820.918	20.377	16.995	52.387	- 311.390	- 0.066	- 188.079	12.851
Sum Sq. Dev.	56,321.260	29.958	19.613	4,923.219	22,065,871.000	22.277	375,520.200	155.582
Observations	272	272	272	272	272	272	272	272

Unit Root test

Table 24: Im, Pesaran and Shin test- Level

SSS Oil exporting countries Panel Forecasted Data, Im, Pesaran and Shin W-stat

H_0: variable has unit root

Variables	T-Stats	Prob*
Borrowing	0.237	0.594
Corruption	-1.060	0.145
CPI	-8.656	0.000
LINV	3.146	0.999
LGDP	5.518	1.000
oil price	6.787	1.000
DDurable	1.501	0.933
UN	-2.645	0.004

Table 25: Im, Pesaran and Shin test- 1st Difference

SSS Oil exporting countries panel data-Forecasted

Im, Pesaran and Shin

H_0: variable has unit root

Variables	T-Stats	Prob*
Borrowing	-13.209	0.000
Corruption	-8.359	0.000
CPI	-8.656	0.000
LINV	-14.079	0.000
LGDP	-10.401	0.000
oil price	-11.809	0.000
Durable	-11.389	0.000
UN	-5.989	0.000

Table 26: Response of DOILPRICE

Impulse response function table and graph for forecasted data

Period	DOILPRICE	DLINV	DLGDP	DUN	DDURABLE	DCORRUPTION	DBORROWING	DCPI
1	14.720	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Prob	-0.651	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	1.474	0.312	-2.058	-0.133	-2.511	-0.8097	-1.401	-0.327
Prob	-1.165	-0.933	-1.618	-0.967	-0.955	-0.973	-1.226	-0.740
3	-1.595	0.857	-1.355	0.311	-1.080	-0.534	-1.028	-0.674
Prob	-1.536	-0.922	-1.626	-0.985	-0.937	-0.994	-1.260	-0.614
4	-0.627	0.492	0.229	0.114	-0.105	0.021	-0.292	-0.440
Prob	-0.855	-0.519	-0.687	-0.400	-0.548	-0.675	-0.470	-0.438
5	0.034	0.347	0.220	0.055	0.083	-0.320	-0.161	-0.289
Prob	-0.507	-0.385	-0.452	-0.318	-0.293	-0.519	-0.315	-0.307
6	0.041	0.166	0.053	0.106	0.035	-0.216	-0.084	-0.184
Prob	-0.300	-0.237	-0.239	-0.164	-0.159	-0.318	-0.193	-0.193
7	-0.023	0.205	-0.021	0.104	0.000	-0.154	-0.133	-0.137
Prob	-0.158	-0.204	-0.138	-0.124	-0.078	-0.193	-0.141	-0.135
8	-0.048	0.132	-0.005	0.070	-0.007	-0.081	-0.083	-0.089
Prob	-0.093	-0.139	-0.077	-0.078	-0.048	-0.105	-0.092	-0.095
9	-0.024	0.097	0.004	0.038	0.000	-0.065	-0.068	-0.062
Prob	-0.056	-0.099	-0.050	-0.050	-0.033	-0.072	-0.072	-0.072
10	-0.016	0.061	0.007	0.026	0.001	-0.039	-0.039	-0.040
Prob	-0.037	-0.065	-0.032	-0.033	-0.023	-0.049	-0.046	-0.053

Table 27: Response of DLINV:

Period	DOILPRICE	DLINV	DLGDP	DUN	DDURABLE	DCORRUPTION	DBORROWING	DCPI
1	0.014	0.322	0.000	0.000	0.000	0.000	0.000	0.000
Prob	-0.020	-0.014	0.000	0.000	0.000	0.000	0.000	0.000
2	0.043	0.004	-0.011	0.029	0.005	0.050	-0.021	0.012
Prob	-0.025	-0.020	-0.035	-0.021	-0.021	-0.0213	-0.027	-0.016
3	0.035	0.014	-0.021	0.008	0.003	-0.005	-0.033	0.002
Prob	-0.033	-0.020	-0.036	-0.021	-0.020	-0.022	-0.027	-0.013
4	-0.013	-0.011	-0.003	-0.008	-0.009	0.004	-0.001	0.000
Prob	-0.017	-0.011	-0.014	-0.008	-0.010	-0.014	-0.011	-0.009
5	-0.007	0.004	0.002	-0.005	-0.003	-0.002	-0.004	-0.003
Prob	-0.008	-0.008	-0.010	-0.006	-0.006	-0.011	-0.007	-0.008
6	-0.002	0.000	0.004	0.000	0.000	0.002	0.004	-0.001
Prob	-0.005	-0.005	-0.005	-0.003	-0.003	-0.006	-0.005	-0.004
7	0.002	0.002	0.001	0.000	0.001	-0.002	-0.001	-0.001
Prob	-0.003	-0.005	-0.002	-0.003	-0.001	-0.005	-0.003	-0.003
8	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000
Prob	-0.002	-0.003	-0.001	-0.002	-0.001	-0.002	-0.002	-0.002
9	0.000	0.001	-0.001	0.000	0.000	-0.001	-0.001	0.000
Prob	-0.001	-0.002	-0.001	-0.001	0.000	-0.002	-0.002	-0.001
10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Prob	-0.001	-0.001	0.000	-0.001	0.000	-0.001	-0.001	-0.001

Table 28: Response of DLGDP:

Period	**DOILPRICE**	**DLINV**	**DLGDP**	**DUN**	**DDURABLE**	**DCORRUPTION**	**DBORROWING**	**DCPI**
1	0.086	0.064	0.250	0.000	0.000	0.000	0.000	0.000
Prob	-0.017	-0.016	-0.011	0.000	0.000	0.000	0.000	0.000
2	0.013	0.056	-0.017	0.016	-0.010	0.007	-0.006	0.002
Prob	-0.021	-0.017	-0.030	-0.018	-0.017	-0.0179	-0.023	-0.014
3	0.001	0.027	0.008	0.025	0.008	0.017	-0.014	-0.005
Prob	-0.027	-0.017	-0.030	-0.018	-0.017	-0.018	-0.023	-0.011
4	0.003	0.005	-0.003	0.003	0.003	0.004	-0.008	-0.004
Prob	-0.014	-0.009	-0.012	-0.007	-0.008	-0.012	-0.009	-0.008
5	-0.001	-0.002	0.002	-0.002	0.000	-0.004	-0.003	-0.004
Prob	-0.007	-0.007	-0.008	-0.005	-0.005	-0.009	-0.006	-0.006
6	-0.002	0.001	0.001	-0.001	-0.001	-0.003	-0.001	-0.003
Prob	-0.004	-0.004	-0.004	-0.003	-0.002	-0.005	-0.003	-0.004
7	-0.001	0.002	0.001	0.001	0.000	-0.002	-0.001	-0.002
Prob	-0.002	-0.004	-0.002	-0.002	-0.001	-0.004	-0.003	-0.003
8	0.000	0.002	0.000	0.001	0.000	-0.001	-0.001	-0.001
Prob	-0.001	-0.002	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002
9	0.000	0.001	0.000	0.001	0.000	-0.001	-0.001	-0.001
Prob	-0.001	-0.002	-0.001	-0.001	0.000	-0.001	-0.001	-0.001
10	0.000	0.001	0.000	0.000	0.000	-0.001	-0.001	-0.001
Prob	-0.001	-0.001	0.000	-0.001	0.000	-0.001	-0.001	-0.001

Table 29 Response of DDURABLE:

Period	DOILPRICE	DLINV	DLGDP	DUN	DDURABLE	DCORRUPTION	DBORROWING	DCPI
1	0.269	0.381	-0.023	4.464	0.000	0.000	0.000	0.000
Prob	-0.280	-0.280	-0.279	-0.197	0.000	0.000	0.000	0.000
2	-0.060	0.151	-0.423	-0.050	-0.281	0.125	-0.438	-0.050
Prob	-0.350	-0.279	-0.491	-0.291	-0.289	-0.2964	-0.374	-0.225
3	-0.202	-0.024	0.003	-0.117	0.104	0.027	-0.352	0.068
Prob	-0.447	-0.272	-0.489	-0.293	-0.277	-0.296	-0.374	-0.181
4	-0.179	0.041	0.086	-0.051	0.042	-0.064	0.043	0.001
Prob	-0.209	-0.140	-0.169	-0.092	-0.126	-0.190	-0.122	-0.110
5	-0.019	0.003	0.086	-0.044	0.008	0.070	0.021	0.001
Prob	-0.101	-0.102	-0.103	-0.078	-0.059	-0.148	-0.075	-0.084
6	0.029	0.024	0.031	0.014	0.010	0.011	0.020	0.006
Prob	-0.063	-0.063	-0.052	-0.042	-0.031	-0.076	-0.050	-0.050
7	0.020	-0.013	-0.001	0.003	0.003	0.003	0.010	0.003
Prob	-0.035	-0.057	-0.028	-0.031	-0.015	-0.051	-0.037	-0.032
8	0.007	-0.004	-0.008	0.001	0.001	0.001	-0.004	0.001
Prob	-0.021	-0.034	-0.015	-0.018	-0.008	-0.025	-0.023	-0.020
9	-0.004	-0.003	-0.003	-0.001	-0.001	0.000	0.001	0.000
Prob	-0.010	-0.025	-0.008	-0.011	-0.004	-0.016	-0.019	-0.013
10	-0.001	-0.001	0.000	-0.002	0.000	0.000	0.000	0.000
Prob	-0.006	-0.015	-0.004	-0.007	-0.002	-0.009	-0.010	-0.009

Table 30 Response of DCORRUPTION:

Period	DOILPRICE	DLINV	DLGDP	DUN	DDURABLE	DCORRUPTION	DBORROWING	DCPI
1	0.010	-0.001	0.012	0.011	0.283	0.000	0.000	0.000
Prob	-0.018	-0.018	-0.018	-0.018	-0.013	0.000	0.000	0.000
2	-0.004	-0.024	-0.018	0.015	0.088	-0.003	-0.004	-0.018
Prob	-0.023	-0.018	-0.031	-0.019	-0.019	-0.0187	-0.024	-0.014
3	-0.017	-0.026	0.004	-0.016	-0.004	-0.017	0.010	-0.013
Prob	-0.031	-0.018	-0.031	-0.019	-0.019	-0.020	-0.025	-0.012
4	-0.006	-0.006	0.003	-0.008	-0.008	-0.020	0.005	-0.007
Prob	-0.019	-0.011	-0.014	-0.008	-0.012	-0.013	-0.008	-0.010
5	-0.001	0.005	0.001	0.004	-0.001	-0.007	0.002	-0.003
Prob	-0.009	-0.008	-0.010	-0.006	-0.005	-0.010	-0.007	-0.008
6	0.001	0.007	-0.001	0.005	0.000	-0.002	-0.003	-0.001
Prob	-0.006	-0.005	-0.005	-0.003	-0.003	-0.007	-0.004	-0.005
7	0.000	0.003	-0.001	0.002	0.000	0.000	-0.002	-0.001
Prob	-0.003	-0.004	-0.003	-0.003	-0.002	-0.005	-0.003	-0.003
8	0.000	0.001	0.000	0.000	0.000	-0.001	-0.002	-0.001
Prob	-0.002	-0.003	-0.002	-0.002	-0.001	-0.003	-0.002	-0.002
9	-0.001	0.001	0.000	0.000	0.000	0.000	-0.001	0.000
Prob	-0.001	-0.002	-0.001	-0.001	-0.001	-0.002	-0.002	-0.001
10	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
Prob	-0.001	-0.002	-0.001	-0.001	0.000	-0.001	-0.001	-0.001

Table 31 Response of DBORROWING:

Period	DOILPRICE	DLINV	DLGDP	DUN	DDURABLE	DCORRUPTION	DBORROWING	DCPI
1	-2.039	-8.344	-8.129	1.523	0.489	34.415	0.000	0.000
Prob	-2.275	-2.243	-2.183	-2.152	-2.151	-1.521	0.000	0.000
2	-0.056	-2.076	5.494	-2.133	0.267	-3.216	3.515	-3.129
Prob	-2.871	-2.298	-3.995	-2.376	-2.360	-2.4172	-3.039	-1.835
3	2.276	-10.739	-0.048	-4.194	-0.155	-2.117	5.164	-1.388
Prob	-3.646	-2.325	-4.084	-2.436	-2.301	-2.455	-3.076	-1.509
4	1.092	0.237	-0.773	0.486	0.260	-3.535	-0.052	-1.282
Prob	-2.000	-1.442	-2.052	-1.202	-1.259	-1.807	-1.625	-1.031
5	-1.018	0.067	-0.782	0.925	-0.401	-0.773	0.783	-0.559
Prob	-1.613	-1.148	-1.652	-1.040	-0.994	-1.520	-1.248	-0.901
6	-0.013	0.914	-0.428	0.433	0.041	-0.716	-0.872	-0.416
Prob	-0.917	-0.713	-0.825	-0.490	-0.518	-0.841	-0.681	-0.504
7	-0.148	0.232	-0.080	0.265	0.016	-0.161	-0.148	-0.103
Prob	-0.500	-0.582	-0.478	-0.350	-0.263	-0.663	-0.430	-0.373
8	-0.076	0.343	-0.036	0.039	-0.003	-0.250	-0.328	-0.136
Prob	-0.314	-0.347	-0.294	-0.217	-0.159	-0.346	-0.294	-0.193
9	-0.103	0.127	0.045	0.054	-0.013	0.005	-0.061	-0.054
Prob	-0.164	-0.280	-0.141	-0.131	-0.080	-0.231	-0.198	-0.130
10	-0.021	0.148	0.034	0.028	0.003	-0.064	-0.089	-0.059
Prob	-0.090	-0.162	-0.093	-0.080	-0.049	-0.111	-0.119	-0.072

Table 32: Response of DUN:

Period	DOILPRICE	DLINV	DLGDP	DUN	DDURABLE	DCORRUPTION	DBORROWING	DCPI
1	0.160	-0.038	0.352	-0.033	0.011	0.096	0.621	0.000
	-0.046	-0.045	-0.042	-0.039	-0.039	-0.039	-0.027	0.000
2	0.290	-0.045	-0.121	-0.004	0.035	-0.007	-0.086	-0.009
	-0.060	-0.046	-0.081	-0.048	-0.048	-0.0489	-0.062	-0.037
3	0.031	-0.055	-0.078	0.076	0.000	-0.013	0.041	0.017
	-0.076	-0.049	-0.088	-0.052	-0.050	-0.053	-0.067	-0.034
4	-0.025	-0.011	-0.050	-0.023	-0.019	-0.035	-0.038	-0.012
	-0.046	-0.031	-0.045	-0.026	-0.027	-0.038	-0.035	-0.021
5	-0.025	-0.012	0.000	-0.005	-0.006	0.010	0.005	0.003
	-0.026	-0.021	-0.025	-0.016	-0.016	-0.029	-0.018	-0.017
6	-0.004	0.009	0.006	-0.004	0.000	-0.010	-0.001	-0.002
	-0.016	-0.014	-0.016	-0.010	-0.009	-0.017	-0.014	-0.010
7	0.002	-0.004	0.003	0.000	0.001	0.006	0.005	0.002
	-0.009	-0.011	-0.008	-0.006	-0.004	-0.012	-0.008	-0.006
8	0.003	0.003	0.000	0.001	0.001	-0.001	-0.002	0.000
	-0.005	-0.007	-0.004	-0.004	-0.002	-0.006	-0.005	-0.004
9	0.000	-0.002	0.000	0.000	0.000	0.002	0.001	0.001
	-0.003	-0.005	-0.002	-0.002	-0.001	-0.003	-0.004	-0.003
10	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	0.000
	-0.001	-0.003	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002

Table 33: Response of CPI

Period	DOILPRICE	DLINV	DLGDP	DUN	DDURABLE	DCORRUPTION	DBORROWING	DCPI
1	8.909	45.861	-0.838	-7.970	-16.947	-64.579	1.284	194.327
	-13.174	-13.011	-12.852	-12.847	-12.821	-12.477	-12.146	-8.588
2	-0.566	-5.107	-54.900	-8.852	12.202	-1.404	-15.265	118.898
	-18.323	-15.387	-24.312	-15.544	-15.453	-15.7600	-19.057	-11.825
3	-5.322	-14.105	-2.250	-19.404	3.108	145.730	-3.160	92.602
	-28.023	-18.534	-28.005	-19.345	-18.908	-18.415	-21.627	-11.321
4	-0.995	-21.959	16.674	-29.561	-1.392	72.100	21.376	56.438
	-25.331	-16.218	-24.831	-15.545	-17.345	-17.195	-18.164	-13.330
5	15.045	-57.807	12.325	-32.497	1.164	52.583	34.949	38.122
	-23.935	-15.183	-22.733	-14.294	-14.814	-15.744	-17.262	-12.348
6	15.175	-35.561	3.633	-18.731	1.785	25.675	23.284	23.687
	-18.670	-12.062	-16.698	-10.124	-11.846	-13.228	-12.059	-11.899
7	6.503	-28.154	-0.716	-11.034	-0.533	17.526	20.150	15.750
	-14.210	-10.354	-13.825	-8.450	-9.222	-11.145	-10.253	-10.736
8	5.036	-17.435	-2.079	-7.168	-0.074	9.995	10.937	10.151
	-9.589	-8.019	-9.043	-5.711	-6.437	-8.744	-6.644	-9.097
9	2.798	-12.492	-1.527	-4.539	-0.110	6.947	8.163	7.228
	-6.046	-6.569	-6.351	-4.363	-4.352	-7.188	-5.182	-7.521
10	1.864	-7.867	-1.208	-3.298	-0.086	4.181	4.777	4.821
	-3.784	-5.187	-3.975	-3.210	-2.825	-5.519	-3.741	-5.908

Figure 11: Response to Structure One S.D. Innovations

Variance Decomposition table and Graph Results for forecasted data

Table 34: Variance Decomposition of LGDP:

Period	S.E.	LGDP	LINV	DURABLE	CORRUPTION	UN	CPI	BORROWING	OIL_PRICE
1	0.273	100.000	0.000	0.000	0.000	0.000	0.000	0.000	0
2	0.393	97.370	2.162	0.183	0.032	0.013	0.006	0.060	0.1445
3	0.499	94.460	4.030	0.821	0.025	0.112	0.007	0.334	0.14101
4	0.587	92.635	5.115	1.151	0.037	0.2267	0.010	0.558	0.16696
5	0.664	91.746	5.623	1.267	0.050	0.319	0.011	0.668	0.17771
6	0.733	91.228	5.943	1.302	0.057	0.379	0.012	0.733	0.17753
7	0.797	90.869	6.183	1.318	0.062	0.416	0.013	0.775	0.17339
8	0.856	90.596	6.365	1.335	0.065	0.441	0.013	0.806	0.17159
9	0.911	90.381	6.505	1.351	0.066	0.461	0.013	0.833	0.17183
10	0.963	90.208	6.615	1.364	0.067	0.478	0.014	0.855	0.17253

Table 35: Variance Decomposition of LINV:

Period	S.E.	LGDP	LINV	DURABLE	CORRUPTION	UN	CPI	BORROWING	OIL_PRICE
1	0.323	6.100	93.900	0.000	0.000	0.000	0.000	0.000	0
2	0.467	5.984	91.407	0.478	0.040	0.050	0.011	1.242	0.76538
3	0.591	5.540	88.886	0.804	0.070	0.523	0.025	1.687	2.3626
4	0.686	5.149	87.909	0.829	0.055	0.7629	0.021	2.097	2.98501
5	0.771	5.030	87.353	0.769	0.043	0.935	0.024	2.371	3.18902
6	0.847	5.009	87.131	0.737	0.037	1.004	0.021	2.422	3.29529
7	0.918	4.971	86.947	0.722	0.033	1.065	0.018	2.445	3.41544
8	0.984	4.932	86.805	0.715	0.029	1.117	0.016	2.484	3.49209
9	1.046	4.901	86.704	0.710	0.026	1.159	0.015	2.515	3.53913
10	1.105	4.880	86.622	0.704	0.023	1.192	0.014	2.539	3.57651

Table 36: Variance Decomposition of DURABLE:

Period	S.E.	LGDP	LINV	DURABLE	CORRUPTION	UN	CPI	BORROWING	OIL_PRICE
1	4.513	0.116	0.675	99.209	0.000	0.000	0.000	0.000	0
2	6.401	0.186	1.281	97.726	0.212	0.430	0.042	0.090	0.03283
3	7.799	0.261	1.451	96.590	0.189	1.253	0.058	0.169	0.02639
4	8.977	0.280	1.564	96.033	0.180	1.6307	0.061	0.162	0.08447
5	9.994	0.265	1.634	95.697	0.173	1.850	0.067	0.167	0.14341
6	10.919	0.242	1.711	95.472	0.162	1.981	0.068	0.175	0.18294
7	11.774	0.225	1.762	95.329	0.152	2.068	0.070	0.181	0.20745
8	12.569	0.212	1.798	95.223	0.143	2.135	0.072	0.188	0.22396
9	13.316	0.202	1.826	95.140	0.135	2.189	0.073	0.192	0.23771
10	14.023	0.194	1.847	95.075	0.129	2.231	0.074	0.195	0.24891

Table 37: Variance Decomposition of CORRUPTION

Period	S.E.	LGDP	LINV	DURABLE	CORRUPTION	UN	CPI	BORROWING	OIL_PRICE
1	0.264	0.320	0.129	0.083	98.023	0.000	0.000	0.000	0
2	0.420	0.150	0.792	0.291	92.779	0.047	0.340	0.249	0.0264
3	0.520	0.109	2.537	0.192	88.919	0.033	0.671	0.483	0.01885
4	0.588	0.096	4.892	0.152	83.773	0.0421	1.052	0.867	0.16521
5	0.640	0.090	7.221	0.242	77.581	0.104	1.529	1.433	0.65447
6	0.686	0.110	9.285	0.582	71.117	0.168	1.997	2.025	1.49372
7	0.728	0.173	11.017	1.117	65.116	0.204	2.376	2.506	2.47748
8	0.767	0.272	12.399	1.707	59.954	0.216	2.676	2.871	3.38698
9	0.804	0.381	13.473	2.262	55.693	0.216	2.915	3.152	4.12303
10	0.839	0.483	14.320	2.744	52.221	0.211	3.105	3.370	4.69457

Table 38: Variance Decomposition of UN:

Period	S.E.	LGDP	LINV	DURABLE	CORRUPTION	UN	CPI	BORROWING	OIL_PRICE
1	0.744	24.215	2.806	0.168	0.000	72.792	0.000	0.000	0.000
2	1.055	21.842	3.460	0.112	0.104	65.164	0.000	0.013	9.288
3	1.315	17.889	4.318	0.288	0.099	63.396	0.017	0.013	13.949
4	1.506	15.428	4.923	0.312	0.077	62.289	0.013	0.027	16.886
5	1.675	13.794	5.466	0.317	0.088	61.959	0.011	0.025	18.285
6	1.826	12.746	5.737	0.329	0.130	61.674	0.010	0.037	19.260
7	1.968	11.919	5.974	0.356	0.180	61.422	0.009	0.039	20.003
8	2.100	11.313	6.115	0.387	0.226	61.182	0.008	0.038	20.618
9	2.225	10.823	6.236	0.414	0.265	61.001	0.007	0.037	21.090
10	2.343	10.429	6.336	0.436	0.295	60.847	0.007	0.037	21.477

Table 39: Variance Decomposition of CPI:

Period	S.E.	LGDP	LINV	DURABLE	CORRUPTION	UN	CPI	BORROWING	OIL_PRICE
1	212.510	0.496	4.238	0.227	1.085	0.351	92.812	0.000	0.000
2	259.992	2.726	2.835	0.322	0.758	0.843	86.371	5.132	0.479
3	330.456	1.739	2.251	0.603	0.849	0.789	56.697	36.266	0.298
4	368.540	2.023	2.594	1.198	0.757	1.603	52.042	38.744	0.245
5	405.094	1.697	4.842	1.854	0.688	2.540	49.566	36.861	0.588
6	436.209	1.475	5.251	2.414	0.752	2.803	48.193	36.742	0.742
7	463.517	1.312	5.373	2.733	0.874	3.069	47.294	36.911	0.706
8	490.133	1.183	5.545	2.995	1.009	3.248	46.466	37.031	0.692
9	515.733	1.080	5.707	3.240	1.118	3.394	45.809	37.050	0.689
10	540.126	0.994	5.860	3.454	1.203	3.522	45.195	37.106	0.685

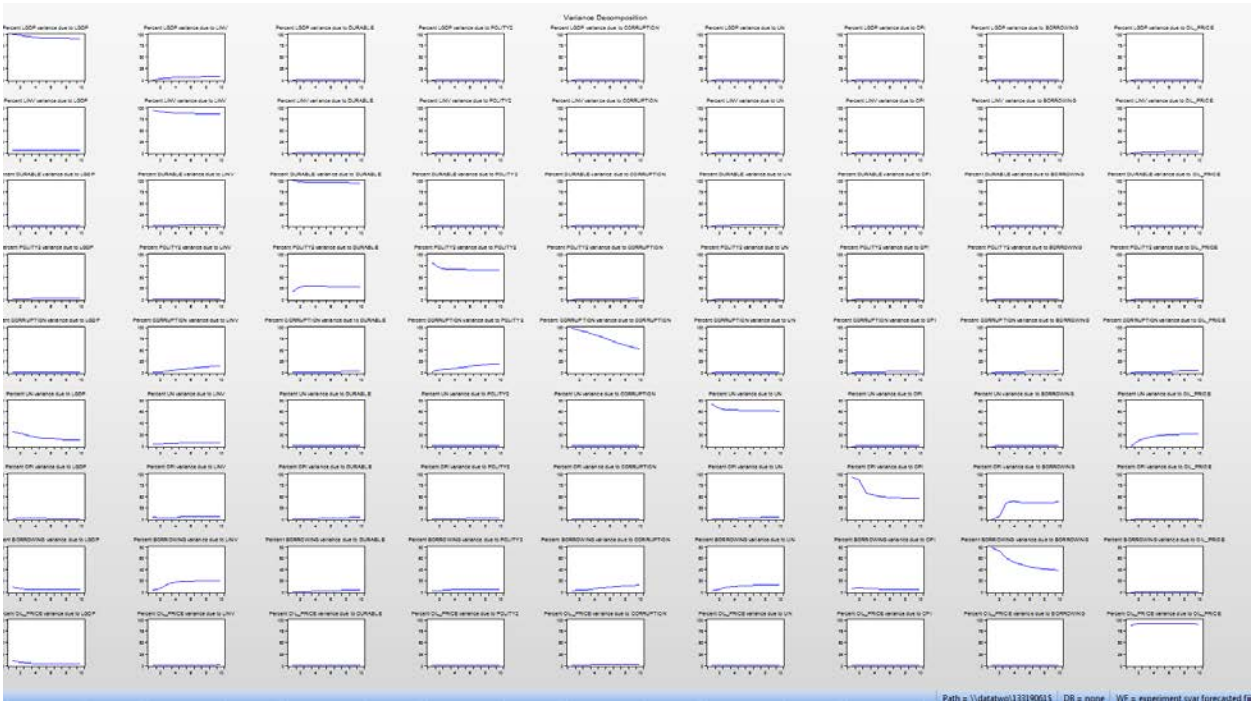
Table 40: Variance Decomposition of BORROWING:

Period	S.E.	LGDP	LINV	DURABLE	CORRUPTION	UN	CPI	BORROWING	OIL_PRICE
1	35.764	7.909	2.932	0.272	1.443	2.305	5.828	78.008	0.000
2	48.090	5.334	5.466	0.156	2.964	4.689	6.490	72.997	0.158
3	60.408	4.845	13.784	0.621	3.846	8.145	5.950	59.717	0.110
4	69.305	4.738	16.940	1.376	5.281	9.686	5.300	52.705	0.087
5	77.119	4.977	18.390	1.860	6.863	10.856	4.892	47.812	0.104
6	84.389	5.049	18.965	2.208	8.425	11.437	4.628	44.719	0.135
7	91.179	5.043	19.365	2.481	9.686	11.870	4.409	42.446	0.165
8	97.631	5.017	19.750	2.712	10.606	12.185	4.253	40.689	0.180
9	103.727	4.978	20.072	2.897	11.259	12.449	4.139	39.354	0.189
10	109.456	4.948	20.358	3.039	11.729	12.684	4.052	38.295	0.193

Table 41: Variance Decomposition of OIL_PRICE:

Period	S.E.	LGDP	LINV	DURABLE	CORRUPTION	UN	CPI	BORROWING	OIL_PRICE
1	14.846	10.023	0.165	0.261	0.036	0.355	0.323	0.171	88.622
2	22.454	6.763	0.073	0.226	0.810	0.216	0.395	0.103	91.369
3	27.552	5.004	0.263	0.281	1.516	0.511	0.350	0.070	91.815
4	31.583	4.230	0.551	0.309	1.934	0.758	0.347	0.055	91.534
5	35.126	3.815	0.853	0.318	2.092	0.980	0.395	0.066	91.146
6	38.300	3.550	1.088	0.322	2.098	1.152	0.428	0.065	90.919
7	41.182	3.396	1.301	0.317	2.041	1.291	0.449	0.061	90.725
8	43.841	3.299	1.460	0.306	1.969	1.391	0.466	0.059	90.595
9	46.343	3.232	1.581	0.293	1.897	1.466	0.482	0.058	90.503
10	48.711	3.181	1.679	0.281	1.832	1.525	0.494	0.057	90.433

Figure 7: Variance Decomposition (Combined Graph)



[i] See Gottschalk (2001) for a comprehensive review of the appropriateness of the SVAR Methodology as a useful tool in identifying and modelling the behaviour of macroeconomic variables to unexpected shocks.